

ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF
ARTS AND SOCIAL SCIENCES

**THE RELATIONSHIP BETWEEN HUMAN CAPITAL AND ECONOMIC
GROWTH: THE CASE OF TURKEY 1980-2013**

M. A. THESIS

Ayşenur KARAKAŞ AYDINBAKAR

Master of Arts in Economics

DECEMBER 2015

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Thesis Advisor: Prof. Dr. Fuat ERDAL

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İSTANBUL TEKNİK ÜNİVERSİTESİ ★ SOSYAL BİLİMLER ENSTİTÜSÜ

**BEŞERİ SERMAYE VE EKONOMİK BÜYÜME İLİŞKİSİ: TÜRKİYE
ÖRNEĞİ 1980-2013**

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To my father

To my spouse

FOREWORD

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ABBREVIATIONS

GDP	: Gross Domestic Product
GMM	: Generalized Method of Moments
GSYİH	: Gayri Safi Yurtiçi Hasıla
MEB	: Republic of Turkey Ministry of National Education
OECD	: Organization for Economic Co-operation and Development
OLS	: Ordinary Least Squares
ÖSYM	: Measuring, Selection and Placement Centre
PIM	: Perpetual Inventory Method
PISA	: Programme for International Student Assessment
SIC	: Schwarz Information Criterion
TUIK	: Turkish Statistical Institute
UNDP	: United Nations Development Programme
WB	: World Bank
YÖK	: Turkish Higher Education Institution

SYMBOLS

Y	: Level of output
K	: Total capital
N	: Total number of workers
N^e	: Effective labor
h	: Skilled worker
β	: Share of total capital
$1 - \beta$	: Share of effective labor
$u(h)$	: Fraction of leisure time spent on the current production
$1 - u(h)$	: Fraction of leisure time devoted to skill
A	: Level of technology
$\dot{A}$	: Growth in aggregate stock of technology
H_A	: Human capital in the research and development
H_y	: Human capital in final output
h_a	: External effect of human capital
$\dot{h}$	: Growth rate of the accumulation of human capital
k	: Rate of common consumption and per capita capital
γ	: Fraction of exogeneity
δ	: Maximum rate that the growth rate of human capital's accumulation attains
ϑ	: Productivity parameter
H	: Stock of human capital
L	: Labor
α	: Share of capital
β	: Share of labor
$1 - \alpha - \beta$	: Share of stock of human capital
I_t	: Capital investment at time t
K_t	: Capital stock at time t
K_0	: Initial capital stock
c	: Capital-output ratio
d	: Depreciation rate
g	: Growth rate of output
i	: Investment rate
E_t	: Index value for year t
V_t	: Raw data for the year t
V_{max}	: Maximum values of the series over time period
V_{min}	: Minimum values of the series over time period
y_t	: Gross domestic product (GDP) per labor at time t
k_t	: Capital stock per labor at time t
h_t	: Human capital index at time t
C	: Constant term
α_0	: Constant term
ε_t	: White noise residual term at the time t

t	: Time
H_0	: Null hypothesis
H_A	: Alternative hypothesis
$I(1)$	: Integrated at order one

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THE RELATIONSHIP BETWEEN HUMAN CAPITAL AND ECONOMIC GROWTH: THE CASE OF TURKEY 1980-2013

SUMMARY

The effect of human capital on economic growth has widely acknowledged by the endogenous growth theory. The relationship between human capital and economic growth is analyzed for Turkey between 1980 and 2013 in this thesis by using time series analysis. Gross domestic product (GDP) per labor is chosen as the dependent variable. Capital stock per labor and human capital index are used as the independent variables. The number of students in primary education (primary and secondary school), high school (general and vocational high school) and higher education (university), high school (general and vocational high school) enrollment rate and higher education (university) enrollment rate, public spending on health as a share of gross domestic product (GDP), total spending on health as a share of gross domestic product (GDP), life expectancy at birth, the number of health institution per person, the number of bed in hospitals per person, the number of healthcare personnel (physicians, dentists, nurses, midwives, pharmacists, health officers) per person, the number of newspaper per person, the number of library per person, the number of book per person, telephone line per person are selected as components of human capital. Education, health and socio-cultural indices are constructed and then they are aggregated by unweighted average in order to obtain human capital index.

Unit root test is used to determine stationarity levels of the variables. The long-run relationship amongst the variables is examined by Johansen cointegration test. A growth model is estimated by Generalized Method of Moments (GMM) by using annual data from 1980 to 2013. As a result of the econometric analysis, the long-run relationship between gross domestic product (GDP) per labor, capital stock per labor and human capital index in Turkey between the years 1980 and 2013 is determined. The estimated model by GMM reveals that capital stock per labor and human capital index significantly and positively affect gross domestic product (GDP) per labor. The results also find out that the effect of capital stock per labor on gross domestic product (GDP) per labor is higher than the effect of human capital index.

BEŞERİ SERMAYE VE EKONOMİK BÜYÜME İLİŞKİSİ: TÜRKİYE ÖRNEĞİ 1980-2013

ÖZET

Beşeri sermayenin ekonomik büyüme üzerindeki etkisi içsel büyüme modellerinde önemle vurgulanmıştır. Bu tezde, 1980 ve 2013 yılları arasında Türkiye’deki beşeri sermaye ve ekonomik büyüme arasındaki ilişki zaman serisi analizi ile incelenmiştir. İş gücü başına düşen gayri safi yurtiçi hasıla (GSYİH) bağımlı değişken olarak kullanılmıştır. Bağımsız değişken olarak iş gücü başına düşen sermaye stoğu ve beşeri sermaye endeksi seçilmiştir. İlköğretim, lise ve yükseköğretimdeki öğrenci sayıları, lise ve yükseköğretim kayıt oranı, kamu sağlık harcamalarının gayri safi yurtiçi hasıla (GSYİH) içindeki payı, toplam sağlık harcamalarının gayri safi yurtiçi hasıla (GSYİH) içindeki payı, doğumda yaşam beklentisi, kişi başına düşen sağlık kurumu sayısı, kişi başına düşen hastanelerdeki yatak sayısı, kişi başına düşen sağlık personeli (hekimler, dişçiler, hemşireler, ebeler, eczacılar, sağlık memurları) sayısı, kişi başına düşen gazete sayısı, kişi başına düşen kütüphane sayısı, kişi başına düşen kitap sayısı, kişi başına düşen telefon hattı sayısı beşeri sermayenin göstergeleri olarak seçilmiştir. Bu göstergelerden eğitim, sağlık ve sosyo-kültürel endeksler oluşturulmuş ve bunlar bir araya getirilerek beşeri sermaye endeksi kurulmuştur.

Değişkenlerin durağanlık derecelerini belirlemek için birim kök testi kullanılmıştır. Değişkenler arasındaki uzun dönemli ilişki Johansen eşbütünleşme testiyle incelenmiştir. Yıllık veriler kullanarak 1980 ve 2013 yılları arasında Genelleştirilmiş Momentler Metodu (GMM) ile bir büyüme modeli tahmin edilmiştir. Ekonometrik analizin sonucunda, 1980 ve 2013 yılları arasında Türkiye’de iş gücü başına düşen gayri safi yurtiçi hasıla (GSYİH), iş gücü başına düşen sermaye stoğu ve beşeri sermaye endeksi arasında uzun dönemli ilişki olduğu belirlenmiştir. Genelleştirilmiş Momentler Metoduyla (GMM) tahmin edilen model, iş gücü başına düşen sermaye stoğunun ve beşeri sermaye endeksinin iş gücü başına düşen gayri safi yurtiçi hasılayı (GSYİH) anlamlı ve pozitif yönde etkilediğini ortaya koymuştur. Tahmin edilen model ayrıca iş gücü başına düşen sermaye stoğunun, iş gücü başına düşen gayri safi yurtiçi hasıla (GSYİH) üzerindeki etkisinin, beşeri sermaye etkisinden daha fazla olduğunu ortaya çıkarmıştır.

1. INTRODUCTION

One of the main objectives of any economy is to obtain high level of living standards and life quality, which basically depend on factors of production that are composed of capital (particularly known as physical capital), labor force, land and entrepreneurship.

Neoclassical growth model, which had prevailed until the mid-1980s and assumed the neutrality of technological change in contrast to today's growth theories, aims to shed light on the differences in growth rate among countries. In addition, Solow (1957, p. 320) determines that gross output per man hour was doubled between 1909 and 1949 and 87.5 per cent of it attributes to technology, the rest of it, 12.5 per cent, attributes to increase in use of capital by analyzing the growth rate of the United States between in 1909-1949. However, the neoclassical growth model not only avoids the complex questions about technology but also accepts technology as a black box in explaining the variation of growth rate (Kibritcioglu, 1998, p. 214).

The concept of economic growth has been refocused since the mid-1980s because of the inadequate assumptions of the neoclassical growth model to explain to real economies. It is claimed that new production factor, named human capital, tackles the failure of the neoclassical growth model. Also, it is the key component of technology, which is not taken exogenously in the previous model. Thus human capital that is based on mainly individual's quality, capacity, knowledge and skills enters into both theoretical and empirical analysis through endogenous growth theory.

Ultimately, the concept of human capital has taken part in the literature for the first time as labor's contribution to create the welfare of countries, by Adam Smith (1776, 1790), who also "emphasized the role of education as well as division of labor, learning by doing and skill" (as cited in Sen, 1997, p. 1959).

1.1 Aim of the Thesis

The main target of the thesis is to construct an index for human capital and then test the relationship between human capital and economic growth in Turkey for the period 1980-2013.

1.2 Importance of the Thesis and Its Method

In the thesis, an Augmented Solow (Mankiw et al, 1992) model that is constructed by adding human capital into the standard neoclassical model is modified to examine the relationship between human capital and economic growth. However, technology is taken exogenously in the thesis. Gross domestic product (GDP) (1998 constant prices) per labor, which is used as the dependent variable, independent variables are capital stock per labor, which is calculated by Perpetual Inventory Method (PIM), and human capital index, which represents human capital. Human capital index is made up of three components. The first component, Education Index consists of the number of students in primary education (primary and secondary school), high school (general and vocational high school), and higher education (university), high school (general and vocational high school) enrollment rate (%) and higher education (university) enrollment rate. The second component, Health Index consists of public spending on health as a share of gross domestic product (GDP), total spending on health as a share of gross domestic product (GDP), life expectancy at birth, the number of health institution per person, the number of bed in hospitals per person, the number of healthcare personnel (physicians, dentists, nurses, midwives, pharmacists, health officers) per person. Finally the third component, Socio-cultural Index consists of the number of newspaper per person, the number of library per person, the number of book per person, telephone line per person are selected as proxies of human capital. These fifteen indicators are standardized by using index formula of Dreher's paper (2006, p. 1093). Johansen (1988) cointegration test is employed to determine the cointegration relationship between human capital and economic growth in Turkey between 1980 and 2013. The effect of human capital on economic growth is estimated by using Generalized Method of Moments (GMM) (Hansen, 1982).

1.3 Structure of the Thesis

Chapter 2 reviews the neoclassical growth model and the main discussions about it benefitting from Lucas's (1988) and Romer's (1990) papers, short brief of human capital history, concept of human capital and some components of human capital such as education and health. The effect of human capital on economic growth and the relevant literature are explained in Chapter 3. Education and health components of human capital in Turkey and in other OECD countries, and assessment of human capital index (World Economic Forum, 2013) are expressed in Chapter 4. Econometric analyses and results are discussed in Chapter 5. Chapter 6 is conclusion part of the thesis.

2. ENDOGENOUS GROWTH THEORY AND HUMAN CAPITAL

2.1 Endogenous Growth Theory

New approaches to economic growth that follows the thoughts of Smith, Schumpeter, Kaldor and Arrow have appeared after the neoclassical growth theory, which stresses the importance of quantitative growth till the middle of 1980s (Yumusak, 2008, p.4). One of the most important reasons why a new growth theory was appeared is that assumptions of the neoclassical growth model give different results in the real world. The assumptions of the neoclassical growth model (Solow, 1956, 1957) depend on the existence of many firms, homogeneity of goods, full employment, no government intervention and the existence of free entry-exit. Level of output in the neoclassical growth model is determined by capital and labor. In addition to these assumptions, the assumptions of the neoclassical growth model which is constant returns to scale, the diminishing marginal return of capital, the exogeneity and neutrality of technological change, the exogeneity of population have been criticized by economists too much. The reason of these criticisms is that the neoclassical growth model does not emphasize some complex issues such as the diffusion of technology, knowledge and information (Romer, 1994, p. 10).

The neoclassical growth model asserts that the differences in long-run real growth rate in the developed and developing countries will be zero by getting closer to same value over time. The main claim of this hypothesis, named “*Convergence Hypothesis*”, is that there is a capital flow from the developed countries to the developing countries, attracted by relatively. Higher interest rates and the increasing level of productivity provides the developing countries relatively higher growth potential during this process, which is called “*Catching-up Process*” (Kibritcioglu, 1998, pp. 214). So, if the developing countries have initially low level of productivity, the catch-up process will be faster (Abramovitz, 1986, pp. 386-387). At the end of this process, the differences in capital levels and interest rates among these countries are equalized and the real growth rate of all countries goes to zero (Kibritcioglu, 1998, pp. 214-215).

Many studies in the literature demonstrate that this hypothesis is not valid for real situations in the new world. Romer (1994) explains why the hypothesis fails. The former reason is the assumption of exogeneity in technological change; the latter one is that every country has the same technological opportunity. As opposed to the neoclassical opinions, Lucas (1988, pp. 14-16) stresses if every country has the same technological opportunity, human capital will not migrate from the place where has a scarce sources to the other place where has an abundant sources.

Abramovitz (1986) examines the catching-up process of sixteen countries by using the data set of Maddison (1982). The productivity gap of the United States, which is called the leader country, expanded by 39 percent between 1938 and 1950, whereas the conditions of poor countries were getting worse compared to the conditions of rich countries. There was no convergence between these countries. However, the gap between initial productivity level and the growth rate among the follower countries was getting smaller during the post-war period, and the variation of productivity level decreased between the leader and the follower countries (Abramovitz, 1986, pp. 390-396).

Mankiw et al. (1992) investigates the reason why income per capita is different among countries by adding human capital into the neoclassical growth model in their study. Convergence takes place slower than Solow's estimation according to their results. In Solow's model, economies of the countries have attained the halfway of their steady state conditions in about 17 years. However, the latter model shows that the reaching of halfway takes about 35 years (Mankiw et al, 1992, p. 433). Also, Barro and Sala-i Martin (1992) specifies that convergence takes place at a slow rate, but if capital mobility is permitted, it is hard to explain the slow rate of convergence (as cited in Romer, 1994, p. 8). Besides, it is known that the conditional convergence actualizes in the countries which have similar institutional structure (Kibritcioglu, 1998, p. 215).

Economic growth depends on various factors. Therefore, in studying the catching-up process and convergence hypothesis, it is necessary to observe countries' political landscape and government policy by going beyond the assumptions of the neoclassical growth model. A change in growth rate would be connected with countries' political and military disruption. There could be a large increases and decreases in growth rates of the poor countries due to these disruptions. On the other

hand, the advanced countries can easily eliminate business-cycle effects in a short time. For example, the growth of GDP in Iran decreased from 11.3 per cent in the 1960s to 2.5 per cent in the 1970s. The growth rate of GDP in Angola was 4.8 per cent in the 1960s and 9.2 per cent in the 1970s (Lucas, 1988, p. 4).

As opposed to the neoclassical growth model, endogenous growth theory, which appears after the mid-1980s, emphasizes that economic growth is endogenous result of economic system (Romer, 1994, p. 3). The discussions in terms of spillover effect are divided into three groups: The first group consisting of Lucas (1988), Stokey (1988, 1991), Becker et al. (1990), Young (1991), and the others believes that spillover effects are caused by human capital; the second group consisting of Romer (1990), Aghion-Howit (1992, 1994), Grossman-Helpman (1989, 1990, 1991), and the others claims that spillover effects are resulted from research and development; the third group consisting of Barro (1991) and the others supports the idea that spillover effects are arisen due to the technological infrastructure provided by government (Kibritcioglu, 1998, p. 218).

Lucas (1988), who is one of the pioneers of endogenous growth theory, highlights the role of schooling and accumulation of human capital for sustained growth. According to Lucas (1988, p.17), individuals in societies desire to maximize their life time utility. These citizens control only two things; their own consumption level and the allocation of time between working and the way of improvement for their skills. So, education is calculated by the time spent for the acquisition of skill. The level of output is denoted by Y , total capital is denoted with K and effective labor is denoted by N^e . The production function is defined as $F(K, N^e)$. The effective labor is determined by $N^e = \int_0^\infty u(h) \cdot N(h) \cdot h \, dh$ because of a worker with skill (h) from 0 to infinity, total number of workers (N), and the fraction of leisure time spent on the current production by a worker $[u(h)]$. The remaining part of $u(h)$, $[1 - u(h)]$, is the fraction of leisure time devoted to skill. The Cobb-Douglas function (2.1) below is formed with an effective labor force spent their leisure time (Lucas, 1988, pp.17-19):

$$Y = A \cdot K^\beta [u(t)h(t)N(t)]^{1-\beta} \quad (2.1)$$

$$\dot{h} = h(t)\delta[1 - u(t)] \quad (2.2)$$

where $\dot{h}$ denotes the growth of the accumulation of human capital. The use of leisure time affects the accumulation of human capital through two ways. If a worker has no efforts [$u(t) = 1$], human capital cannot be accumulated. Namely, when a worker spends his/her time on current production, human capital cannot be accumulated. On the contrary, if a worker spends all of his/her time on the accumulation of human capital [$u(t) = 0$], human capital is accumulated until reaching the maximum rate (δ). In other words, a worker devotes himself/herself to improve his/her ability. The growth rate of output and human capital are same in steady state, and depend on maximum rate (δ) and the determinants of the equilibrium value of $u(t)$. Sustained growth is obtained, since this model accepts the assumption of constant returns in human capital's production (Krueger and Lindahl, 2001, p.1109).

Lucas (1988) stresses difference between human capital and accumulation of physical capital. He claims that human capital is the accumulation of social activities of groups. Therefore, he states the two effects of human capital: the first effect is internal effect which can be defined as human capital has an effect to improve its own productivity; the second is the external effect which results from spillover, affecting the whole production factors, by sharing information.

When the external effect of human capital [$h_a(t)$] is added in the model with the assumption of the exogeneity of technology, the new aggregate production equation (2.3) becomes (Lucas, 1988, pp. 18-22):

$$Y = A.K(t)^\beta . [u(t)h(t)N(t)]^{1-\beta} h_a(t)^\gamma \quad (2.3)$$

The rate of common consumption and per capita capital (k) is given by equation 2.4:

$$k = \left(\frac{1-\beta-\gamma}{1-\beta} \right) \cdot \left[\frac{\dot{h}(t)}{h(t)} \right] \quad (2.4)$$

As a result of this equation, the most important explanatory factors of economic growth are the growth rate of human capital and the fraction of exogeneity in economy (γ) (Kibritcioglu, 1998, p. 225).

Additionally, Lucas (1988) explains the differences of the level of income and growth rate amongst countries by human capital. Rich countries have high level of income, growth rate, welfare and high level of wage. The reason why they have higher wage levels is that these countries have a lot of human capital accumulation because labor who wish to receive more salary move from poor countries to rich

countries. The output ($F(K, N^e)$) is a function of total capital (K) and effective labor (N^e) and a skilled (h) worker's hourly wage equals to $F_N(K, N^e)h$ so his/her total earnings are defined as $F_N(K, N^e)hu(h)$ (Lucas, 1988, p.18). Thus, Lucas (1988) shed light on why the various levels of development occur between countries; thereby he accepts the principle of human capital accumulation.

Paul Romer, who is one of the pioneers of endogenous growth theory, follows the idea of 'learning-by-doing' that is developed by Arrow (1962) in his own studies, which are '*Endogenous Technological Change*' and '*The Origins of Endogenous Growth*' (as cited in Romer, 1990, 1994). According to Romer (1990), human capital and the technological infrastructure, which is invested by government, cause spillover effect, and these effect leads to increasing marginal factor productivity and increasing returns to scale (as cited in Kibritcioglu, 1998, p. 219).

In the study of Romer (1990), the production function of the following type (2.5) is employed:

$$Y(H_y, L, x) = H_y^\alpha L^\beta \int_0^A x(i)^{1-\alpha-\beta} di \quad (2.5)$$

where H_y represents human capital in final output, L is physical labor and $x(i)$ is physical capital. Physical capital is disaggregated into an infinite number of different kinds of producer durables. The capital stock depends on the level of technology, A , which leads to the disaggregation of capital. Also, all people can benefit from knowledge, since it is accepted as a non-rival input.

Growth in aggregate stock of technology (2.6) evolves as;

$$\dot{A} = \vartheta H_A A \quad (2.6)$$

where H_A is human capital employed in the research and development, ϑ is productivity parameter. Namely, the higher human capital is employed, the greater the new technological design progress and the higher the output are (Romer, 1990, pp. 80-84). However, the rate of growth equals to the rate of technological design progress that is accepted as the linear function of human capital in the steady state (Krueger and Lindahl, 2001, p.1109).

As can be seen above, Romer (1994, p. 13) defines the aggregate rate of discovery as endogenous and "the aggregate rate of discovery is still determined by things that people do". Two assumptions are claimed by Romer (1994): The first assumption is

that each unit of the capital investment increases both the stock of physical capital and the level of technology for all firms throughout economy through the channel of knowledge spillover; the second assumption is that increasing labor supply leads to negative spillover effect, since firms are discouraged to discover new innovation in this circumstance. Hence, labor-saving innovations are increased and positive spillover occurs (Romer, 1994, p. 7).

The level of technology (A) can be written as $A(K, L)$. The functional relationship ($A(K, L)$) between A, K, L equals to $K^\gamma L^{-\gamma}$. The external effect of an increase in employment is represented by γ which is greater than zero. A firm j 's output function is $Y_j = A(K, L)K_j^{1-\alpha}L_j^\alpha$ and the choice of firm j for K or L will affect A . α is the private effect of increase in employment and the fraction of output which is paid compensation to labor. The aggregate output as a function of physical capital (K) and labor (L) is $Y = K^{1-\beta}L^\beta$ and β , which is the total impact of an increase in employment, equals to $\alpha - \gamma$. As a result, the total impact of an increase in employment (β) will be smaller than the share of labor (Romer, 1994, pp. 7-8).

The existence of spillover shows that the assumption of constant return to scale is abandoned. In this way, making an investment is cheaper, and the return of the investment is higher with new assumption compared to neoclassical growth model (Kar and Agir, 2006, p. 55). Easterly and Wetzel (1989, pp. 4-5) support abandoning the assumption of constant return to scale by identifying three resources of increased returns to scale. These three sources are the development of human capital, spillover effects of research and development, specialization for increasing return to scale. When firms invest in research and development projects not only the stock of knowledge increases throughout economy but also they contribute to their own productivity. Eventually, they lead to a positive impact on the growth rate.

The reason of the existence of endogenous growth theory are derived neither from the lack of the assumptions of neoclassical growth theory nor to attach importance to technology and human capital. Romer (1994, p. 21) points out that policymakers can solve many debates such as tax subsidies, antitrust exemptions, the impact of government procurement, the feedback between trade policy and innovation, the scope of protection for intellectual property rights, the associations between private firms and higher education institutions, the mechanism for choosing the research

areas, the costs and benefits of an explicit government-led technology by using endogenous growth theory because this theory presents more penetrating ideas than the neoclassical growth theory.

2.2 The Concept of Human Capital

Endogenous growth theory asserts that new production factor is one of the significant resources of economic growth by taking into account technology in opposition to the assumptions of the standard neoclassical growth theory. Dealing with the questions about how long-run and sustainable economic growth takes place and how unexpected economic growth has occurred has been answered with the new production factor named 'human capital'.

Considering the importance of human skills has a long history. The first studies, which are based upon human capital, have been constructed by Adam Smith, John Stuart Mill and Alfred Marshall in the economics literature. Adam Smith who is known as the father of economics expressed that every single skilled or talented citizen in a country is the part of capital. On the contrary to Adam Smith, Alfred Marshall criticizes the impossibility of human capital measurement and the reality of human capital. Moreover, John Stuart Mill expresses his opinion as people should not be used as capital during the progress of welfare (as cited in Schultz, 1961, pp. 2-3).

Hereafter, Schultz (1961), Denison (1962) and Becker (1964, 1975), who are inspired by earlier studies, were known as human capital theorists (as cited in Marginson, 1993, p. 37). They provide the basic definition of human capital. Also, their opinions enlighten the positive relationship between education and training investment, and the return of them as earnings.

Schultz (1961, p. 1) defined human capital as the acquisition of useful skill and knowledge. He argues that Western countries have the chance of faster growth rate with people, who are skilled and have knowledge, are one of the forms of capital. Leisure time to use the improvement of skill and knowledge enhances the quality of human capital. Thus, the level of productivity increases, as well. Schultz (1961, p. 13) explains the difference of earnings because of no schooling, poor health conditions, unskilled and little ability to useful work by citing old times. Five

strategies to improve human capabilities are suggested: health facilities and services, on-the-job training, well-organized education in primary, secondary and higher level, special study programs for adults, migration of individuals and families, which accord advantages for better job opportunities. In his study, expenditure on education rose approximately 3.5 times as fast as the gross formation of capital investment in dollars in the United States. However, the higher attraction of the return of expenditure in education relative to non-human capital is emphasized. Moreover, the unexplained increase (between 36 and 70 percent) of labor's earning in the United States is explained by the return of labor's education. Hence, the main conclusion in his study is that the puzzle of economic growth can be solved by an increase in the rate of human capital.

Denison (1962) emphasizes the contribution of education on economic growth rate by improving skills and productivity level of labor force, and his study that emphasizes the importance of education in the United States between 1929 and 1957 shows that "it raised the average quality of labor by 26.9 per cent, or an average growth rate 0.93 per cent...education contributed 42 per cent of the 1.60 percentage point growth rate in product per person employed" (as cited in Marginson, 1993, p. 37). Becker (2002) defines human capital as "knowledge, information, ideas, skills, and health of individuals". He claims that the successes of economies and individuals depend on the investment in on-the-training, health care and information besides how effectively people use them to improve themselves (Becker, 1962, 2002).

Human capital, inspected by neoclassical economists and today's economists, has been detailed in many aspects. When human capital is defined, various factors are considered, and these factors prevent the exact definition of human capital. The structure of human capital is different from physical capital. In other words, while physical capital consists of tangible assets such as machinery and so on, human capital consists of people. So, if society does not benefit from human capital sufficiently, the dynamic structure of human capital starts to decrease each passing day (Karagul, 2003, p. 82).

The developed and developing countries have to get maximum utility from their production factors to offset increasing population and endless desire for welfare. Under this circumstance, it depends on skill of worker, who has adapted new technology. So, worker's skill has to be developed (Yaylali and Lebe, 2011, p.26).

Human capital is defined as the summation of individual's capacity and capabilities such as knowledge, skill and so on (Cakmak and Gumus, 2005; Koc, 2013; Karagul, 2003). These features are boosted by investing in human, thus human capital becomes irreplaceable input during production process. The short way to reach knowledge, skill and qualification is education. It is claimed that the stock of human capital can be increased by increasing in education opportunity (Serel and Masatci, 2005, p. 49).

According to Adam Smith (1776), educating individuals requires expenses, and these expenses and their results are the accumulation of human capital. Hence, all society benefit from these results, not merely individuals (as cited in Yaylali and Lebe, 2011, p. 28). In other words, human capital, which exists in society and consists of skilled labor, is measured by educational attainment frequently (OECD, 2007, p.26). As the qualification of labor is improved through education in workplace, human capital of society will increase (Kibritcioglu, 1998, p. 207). According to Sen (1997), human capital, named indirect value, is defined as capital in production process besides physical capital. The value of goods and services gets higher by education that makes individuals more efficient and skilled. The income level of people increases (Sen, 1997).

Psacharopoulos (1988, p. 100) expresses that high level earning is related to years of schooling. Each extra year that is spend on education increases worker's salary. Figure 2.1 shows the choice of being more educated tomorrow and less educated today in terms of earnings.

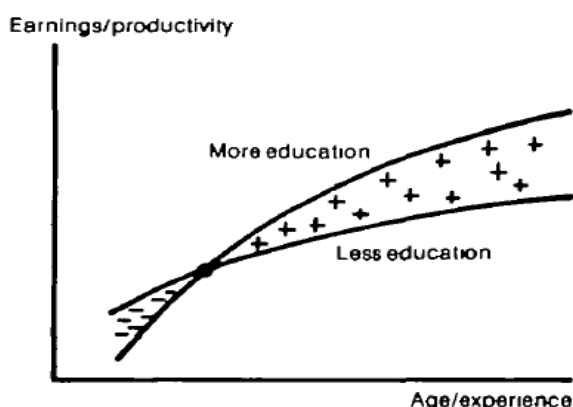


Figure 2.1 : The choice of being more educated tomorrow and less educated today in terms of earnings.

Source: The figure is taken from Psacharopoulos (1988, p.100).

Each educated individual, who participates in labor force, is more productive in both market place and its household. Employer gives more salary to educated worker because of his/her skill and productivity compared to less educated worker. The rate of return on schooling rises as long as more educated worker get higher demand by employer. Empirical studies demonstrate that any change in productivity is caused by the difference education level and worker's training (Mincer, 1981, pp. 5-15).

Many questions lead to the new questions about human capital. Human capital, which affects each part of production, provides the production of new information for innovation and technological advances (Mincer, 1981, p. 18). The positive relationship between well-educated worker and high level technology is expressed in most studies, which support that education is the engine of human capital. However, human capital should not be equal to just education. Health, the amount of dynamic population and brain drain besides education are evaluated as one of the sources of human capital accumulation (Karagul, 2003, p. 81).

Other component of human capital, which is health, becomes important due to changes in the world. The Human Capital Report, issued by World Economic Forum (2013, p. 3), expresses the components of human capital traditionally as one of the function of education and experience. On the other hand, health is one of the crucial parts of human capital in recent years. In the study of Barro (1992, p. 213), school attainment is one of the pieces of human capital, one of other pieces of human capital is health status. In other words, human capital can be measured by using education and health standards in countries (Karatas and Cankaya, 2010, p. 31). Also, health spending as a share of budget, health expenditure per person, the number of bed in a hospital, the amount of population per bed, the number of person per doctor and so on can be used as indicators for health (Karatas and Cankaya, 2010, p. 41). As it is seen, the components of health can be diversified.

The reason why health is important is that healthy individuals are taught by education much easier, and they adapt technological advances more accurate and fast. Additionally, these individuals can be a factor to attain high productivity. It is obvious that health and nutrition are the part of human capital besides knowledge and skill which are embodied by labor force. The importance and impact of health are exemplified as such:

For example, health expenditures may provide relatively direct and immediate and more indirect and longer run benefits. Improved health enhances work effort in the short run and thereby raises growth but also may raise long run growth by raising life expectancy (Kelly, 1997, p. 64).

Additionally, Easterly and Wetzel (1989, pp. 4-5) defines human capital accumulation as the fraction of total accumulation per worker, which is accumulated by job training, health and education.

The interrelationships between the various factors of human capital lead to mutually positive effects. Families, who are well-educated, select to have few children. Educated women decrease the possibility of mortality risk and bad health condition in general, thereby delaying the age of pregnancy (Psacharopoulos, 1995, pp. 4-5). Becker (1975, pp. 17-41) states that human capital can be developed by expenditures on education and health that become a person more skilled. Individuals, who improve their own education level, become more talented to the use of physical capital efficiently. Likewise, healthy individuals increase to quality of market place and society. Accordingly, physical capital and education are not enough to economic growth and productivity.

Education and health should be examined together. The significance of health on productivity is emphasized as follows:

Firms can invest in the health of employees through medical examinations, lunches, or avoidance of activities with high accident and death rates. An investment in health that increased productivity to the same extent in many firms would be a general investment and would have the same effect as general training, while an investment in health that increased productivity more in the firms making it would be a specific investment and would have the same effect as specific training (Becker, 1975, p.41).

Eventually, the factors, which determine the efficiency of human capital, cannot be separated from each other. All of the factors are nested and interacted. Furthermore, these factors establish the dynamic structure (Karagul, 2003, p. 82). Just focusing on education cannot raise the efficiency of human capital. In addition to education, an increase in individuals' quality in their social life affects human capital's efficiency. Individuals' earnings are affected by this efficiency as long as it increases.

3. THE RELATIONSHIP BETWEEN HUMAN CAPITAL AND ECONOMIC GROWTH

3.1 The Effect of Human Capital on Economic Growth

Production process, which is embodiment of economic activity, is linked to the combination of some economic values that depends on the particular requirements and their rates. Use of production factors changes over time by depending on quantitative and qualitative situations. In this regard, the neoclassical growth theory had concentrated on the quantitative side of economic growth (Kibritcioglu, 1998, p. 210). However, empirical studies find out that economic growth, which may not be explained by an increase in the level of standard production factors, is obtained through an increase in community development. Besides, after World War II, economic development and increasing living standards have been obtained by developing human capital rapidly and using information accurately. Particularly, in the 1950s and 1960s, the United States of America, Western Europe and Japan had overutilized technology, which depends on information, during their production processes (Keskin, 2011, p. 141).

Nobody would deny that it is important to examine a relationship between human capital and economic growth deeply. The theoretical and empirical researches about human capital have been continued over the years, and new approaches, which aim to find the relationship between human capital and economic growth, have been developed. Human capital affects economic growth by the channels of an increase in physical capital's productivity, an increase in general productivity, an increase in the employment opportunities, an advance in technology basically (Cakmak and Gumus, 2005, p.61). Additionally, in the literature, education, which plays a key role on human capital, leads to spillover effect. The spillover effect has an impact on an increase in research and development activities, an acceleration of technology, human capital accumulation and labor's productivity (Sari and Soytas, 2006, p. 181).

In the study of Lucas (1988), he uses the way of human capital components such as on-the-job training and years of schooling in a different way from labor economists. Hence, the notion of limitless economic growth is appeared (as cited in Romer, 1989, p. 3). Easterly and Wetzel (1989, p. 14) stresses how to get economic growth by two channels. Firstly, educated and well-trained human capital increase productivity, and so, an increase in output arises. Secondly, investment in human capital leads to increasing return to scale, and thus the long-run growth rate increases.

The rate of an increase in education and being skilled provides individuals more living opportunities considerably. Educated and skilled individuals affect labor force. Qualified labor force dominates the condition of market place, and these individuals have spirit of entrepreneurship (Cakmak and Gumus, 2005, pp. 61-62). In other words, investing in human capital prepares individuals for new job opportunities, and thus the whole economy becomes more competitive all over the world. Economic prospects become more powerful to obtain the high level of economic growth. For example, income levels in Pakistan and Republic of Korea were similar in 1960. However, income level in Korea was almost three times higher than Pakistan's because of differences in school enrolment rate in primary school. Less than a third of children whose age is suitable to enroll primary school went to school in Pakistan in 1960 while this rate was 94 per cent in Republic of Korea (Psacharopoulos, 1995, pp. 2-3).

Studies about the contribution of education on human capital in the beginning of the 1960s reveal that an important part of increasing economic growth is sourced by an increase in labor's education level. Although the contribution rate of education on economic growth alters, several studies figure out that education contributes to economic growth significantly. According to OECD (2005), the contribution ratio is attained to 7 per cent in the United Kingdom, 14 per cent in Belgium, 15 per cent in the United States, 16 per cent in Argentina, 25 per cent in Canada (as cited in Cakmak, 2008, p. 35).

The spillover effect of human capital on technology plays a crucial role on explaining different level of technology among countries. There are many studies that construct the link between the technological gap and differences in human capital stock between countries. Benhabib and Spiegel (1994, pp. 165-166) examines the role of human capital on economic growth rate. Human capital has an important

role on economic growth by affecting physical capital. On the other hand, human capital influences total factor productivity by two channels. The former channel is that the rate of technological innovation increases by producing domestically; the latter channel is that human capital can adapt technology, which is imported from abroad, quickly.

Barro (1992, p. 202) states that human capital has an important effect on both capital mobility and the diffusion of technology. Also, Nelson and Phelps (1966) examines in their study that the absorption of superior technology is eased by human capital, and a country that has high level of human capital tends to grow faster by adjusting the amount of physical capital easily because the adjustment of human capital is quite harder than the adjustment of physical capital (as cited in Barro, 1992, p. 207). According to Karagul (2003, p. 81), individuals' knowledge, skill, and experience enhance both productivity of other factors in production process and use of technological innovation rationally. In this way, the rationality of economic activities is increased, and thus country's economy develops faster.

Becker (1994, pp. 334-346) declares that the amount of investment in human capital increases as long as the stock of human capital enhances. It is sourced by the higher return rate of human capital. Moreover, income per capita becomes higher as long as the investment in human capital rises. An increase in human capital encourages an investment in physical capital because human capital and physical capital are complements in production process. An increase in the stock of human capital boosts to invest in new technologies through expanding education-intensive research and development. Easterly and Wetzel (1989, pp. 4-5) point out that some part of economic growth, which cannot be explained by physical capital, is expressed by human capital. While firms invest in research and development activities in order to increase their own productivity, the stock of knowledge in entire society broadens. As follows, higher growth rate of output is obtained. In other words, Lombardini (1996) expresses that human capital accelerates both to produce technological information and to advance technology (as cited in Cakmak and Gumus, 2005, p. 62). The reason of it is that labor force adapts advanced technology easily thanks to human capital. Existence of these contributions depends on both the high productivity level of human capital and its positive spillover effect, which leads to the high productivity of other factors of production.

The growth of human capital is both the result of economic growth and the reason of economic growth, since human capital enhances total output in economy by increasing the marginal rate of physical capital directly and indirectly. Thus the growth of physical capital rises to the marginal level of human capital (Mincer, 1981, p. 16). In the literature, as the rates of return on investment in human capital in the developing countries are higher than investment in physical capital, the rates of return on investment in human capital are higher than the rates in the developed countries. While the rates of return on physical capital and human capital in the developing countries were 20 per cent and 15 per cent in the 1960s, these rates in the developed countries were 10 per cent and 8 per cent. The rates of return on investment in physical capital and human capital in both the developed and the developed countries were 13 per cent, 15-11 per cent and 9 per cent in the 1970s. These rates have not changed a lot in terms of return. The shares of sources of actual economic growth split into 19 per cent for physical capital, 1.8 per cent for labor, 24 per cent for human capital and 40 per cent for technology. Another finding is that while the development level gets higher, the rate of return on investment in human capital decreases (Karatas and Cankaya, 2010, p. 50).

It can be clearly seen that there is a relationship among the components of human capital and economic growth mutually. Education and skill are the key of future wellbeing by carrying out long-run economic growth and dealing with unemployment, strengthening competitiveness (OECD, 2014a, p. 15). Human capital can produce the required information for technology, create new job opportunities, and increase in the productivity of physical capital. Thus, economic growth occurs. Therefore, it is important that individuals should invest in themselves. When they develop their abilities, both the demand to hire skilled individuals and their earnings will enhance. As a result, human capital leads to economic growth by shifting upward production function on the big picture (Mincer, 1981, pp. 18-19).

3.2 Literature Review

Many empirical studies examining the relationship between economic growth and human capital are constructed by different methods. However, their results have been different from each other. This section aims to summarize the results of empirical studies on the relationship between human capital and economic growth.

Romer (1989) estimates the economic role of human capital on 112 countries by using cross-section method from the year 1960 to 1985 in order to generate practical information. Literacy rate is selected as a proxy of human capital. He estimates the effects of the initial real per capita income, government spending and investment as a share of gross domestic product (GDP) and literacy rate in 1960 on growth. The effect of literacy rate on growth is found both statistically and economically significant. Romer (1989) expresses that the different growth rate of countries stems from the effectiveness of physical capital, not human capital. Also, human capital is a factor to contribute to the improvement of research and development, and physical capital.

There are many human capital studies of Robert J. Barro. In the model of Barro (1991), school enrolment rates in primary and secondary school are chosen as proxies of human capital to study on 98 different countries during the period, 1960-1985. As a result of his analysis, there is a positive relationship between the initial human capital and the growth rates of per capita gross domestic product (GDP). Poor countries, which have a large human capital per person, tend to catch rich countries. Additionally, he highlights that the countries, which have high human capital, have low birth rate and high rate physical capital as a share of gross domestic product (GDP). Another study by Barro and Lee (1994) states if initial level of secondary school attainment and life expectancy are lower than initial level of gross domestic product (GDP) per capita, economic growth is affected positively by constructing panel data set for over 100 countries between 1965 and 1985. Also, Barro and Lee (1994) point out that secondary school attainment is not as important as life expectancy. Higher life expectancy accompanies more effective work behavior and a higher level of skills.

Mankiw et al. (1992) construct three different cross-section models to analyze the non-oil countries, the intermediate countries and the OECD countries during the period, 1960-1985. They aim to show how human capital has an impact on the coefficients of physical capital investment and population growth, and how economic growth is affected by them. Secondary school enrollment rate is used as human capital proxy. In the end of the classical Solow growth model which is reformed by adding human capital, named the Augmented Solow model, human capital reduces the size of physical capital coefficient, and thus this model fits better. These three

variables, which is human capital, physical capital and population growth, figures out 80 per cent of variation between countries in terms of income per capita in the non-oil countries and the intermediate countries (Mankiw et al, 1992, p. 421). Accumulation of physical capital and population growth has a higher effect on income per capita when human capital is added into the model (Mankiw et al, 1992, p. 408).

In the study of Lau et al. (1993) highlights the effects of physical capital, labor, human capital and technology on industrial production in Brazil for the period from 1970 to 1980. Human capital identifies with the average number of years of formal education per person of labor force. Their findings determine that one additional years of formal education boosts real output by about 20 per cent. Technological progress explains 40 per cent of growth in Brazil. While human capital explains approximately 24 per cent of Brazil's growth, the remained parts (19 and 17 per cent) are explained by physical capital and labor, respectively.

Benhabib and Spiegel (1994) construct the cross-section model for 78 countries from the period 1965 to 1985 in order to determine the effect of human capital on income per capita. Following to Kyriacou's (1991), schooling series and past values of human capital enrollment like enrollment in primary, secondary, and tertiary education are used as human capital proxies (as cited in Benhabib and Spiegel, 1994, pp. 146-147). Their cross-section analysis illustrates that while the initial stock of human capital have positive and significant coefficient, surprisingly, the coefficient of the change in human capital has negative and insignificant. The possible explanation is that "a number of countries, most notably many from Africa, began the period with extremely low stocks of human capital" (Benhabib and Spiegel, 1994, pp. 149-150).

Gemmell (1996) explores the effect of human capital on income differences among the selected samples by using cross-section model for 98 countries from the year 1960 to 1985. In his findings, primary education and secondary education contribute to the growth of income in low and middle income countries considerably, whereas higher education for developed countries is more significant. However, he expresses that these results should not be interpreted as the other level of education are not important for low and middle income countries. These results could be sourced by the poor education data set in these countries.

In the study of Asteriou and Agiomirgianakis (2001), the long-run relationship between economic growth and human capital in Greece from the year 1960 to 1994 is examined. Educational variables such as the enrollment rate in primary school, secondary school and higher education are used as the indicators of human capital. The long-run relationship among the variables is determined. There is a causal direction between all of the variables and gross domestic product (GDP) per capita, except higher education.

According to the analysis of Barro (2001), there is a positive relationship between the school attainment rate of adult male in secondary and higher education and economic growth rate by using panel data set for over 100 countries from the year 1965 to 1995. Also, he claims that well-educated workers have a crucial role on the diffusion of technology. The contribution of female is explained by leading to less birth rate. This situation affects economic growth indirectly. In his study, other variables, which are the science, mathematics and reading test scores of students, are used to show the quality dimension of human capital. Science test score has a strong relationship with economic growth among these test scores.

Baldacci et al. (2008) explore the relationship between social spending, human capital and economic growth by constructing panel data set for 118 countries between 1971 and 2000. The sum of gross primary and secondary enrollment rate are selected for education capital. Health capital is calculated by population. Their findings are that health and education spending have a positive impact on education and health capital, and economic growth is affected through this impact.

Krueger and Lindahl (2001) examine the effect of human capital on a change in gross domestic product (GDP) per capita in 78 countries between 1965 and 1985. Their analysis is the replication and extension form of Benhabib and Spiegel's (1994) paper (as cited in Krueger and Lindahl, 2001, p.1112). Following to Barro and Lee (1993), average years of schooling are used as human capital proxy (as cited in Krueger and Lindahl, 2001, pp. 1116-1117). Their findings indicate that the initial stock of human capital and the change in human capital have both positive effects on gross domestic product (GDP) per capita and statistically significant coefficients. Moreover, the average years of schooling in their cross-country regression have a greater effect than in their within-country micro regressions after fixing measurement error.

The relationship between human capital and economic development by using the data set of 177 United Nations Member States is analyzed by Keskin (2011). Multi-linear regression model is constructed on gross domestic product (GDP) per person as dependent variable, and export as a share of gross domestic product (GDP), the number of researcher in research and development activities, total public expenditure on health as a share of gross domestic product (GDP), total public expenditure on education as a share of gross domestic product (GDP), adult literacy rate, average life expectancy, human development index and GINI as independent variables. As a result of the analysis, adult literacy rate, the level of education, total public expenditure on health and expenditure on research and development activities have significant effects on economic development. Adelakun (2011) examines the relationship between human capital and economic growth in Nigeria by Ordinary Least Squares (OLS) method. Total public expenditures in education and health, the enrollment pattern of primary and secondary school and higher education are selected as proxies for human capital. It is found a positive relationship between total public expenditure in education and primary school and secondary school, and there is a positive relationship between total public expenditure in health and secondary school. This study confirms the strong relationship between human capital development and economic growth.

Tian et al. (2011) tests the effect of human capital on economic growth in Yunnan province between 1978 and 2010 by Ordinary Least Squares (OLS). The spending on science, education and culture and health investment are taken to represent human capital's stock. His findings are that there is increasing return of scale in the economic growth of Yunnan province. Moreover, the contribution of physical capital on economic growth is significantly higher than human capital's contribution on economic growth. Physical capital has maximum impact on economic growth as human capital is minimum impact on growth.

Panel causality test is used to test the relationship between human capital and economic growth for 20 OECD countries over the period 1999-2008 by Kesikoglu and Ozturk (2013). The expenditures on education and health are used for the measurement of human capital. The long-run relationship between human capital and economic growth is determined. Bi-directional causality in education expenditure is found. On the contrary, health and economic growth have two-sided causal

relationship. Koc (2013) estimates the relationship between human capital and economic growth by cross-section data set of 27 European Union countries in 2012. Life expectancy at birth, expected years of schooling and average years of schooling are used as the indicators of human capital. The result of estimation is that each indicators of human capital has a positive effect on economic growth.

There are a number of studies on the relationship between economic growth and human capital for Turkey's economy. Although some similar proxies for human capital and econometrics methods are used in these studies, the periods of these studies differ greatly from each other. Additionally, education indicators may leads to different results because of amendment of a basic education law in Turkey.

Coban (2004) tests the long-run and causal relationship between human capital and economic growth in the period 1980-1997. Schooling rates in primary school, secondary (junior high school) school, high school and higher education (university), total public expenditure on education as a share of total spending are selected as proxies for human capital. The long-run relationship is found among the variables, and result of causality test shows that there is a relationship between schooling rates of primary and secondary school and economic growth. Also, the relationship between schooling rate of higher education and schooling rate of high school, the relationship between education spending and schooling rate of high school are found.

Saygili et al. (2005) analyzes the role of human capital on productivity growth in 50 countries, including Turkey, for the period 1981-2002 by using Ordinary Least Squares (OLS). They divide their analyses into four sub-periods, which the average years of education of the labor force is used as a first proxy of human capital, and into three sub-periods, which schooling rates are used as a second proxy of human capital. The empirical results, which both proxies are included into the models, show that the coefficients of human capital are negative, whereas its coefficient for the rest of the countries is positive. These results reveal that Turkey has not benefitted from human capital sufficiently to enhance its productivity growth. The possible explanation is that it is related to the lack of a sufficient environment both in production process and for technological activities.

Serel and Masatci (2005) estimate the relationship between human capital and economic growth over the period 1950-2000. Gross domestic product (GDP), gross fixed capital investment and the amount of total labor force are used as variables in their model. To measure human capital, the amount of student on secondary school is selected. The positive effect of human capital on economic growth is determined by the analysis of co-integration and causality test. The causal relationship is determined from economic growth to human capital, not vice versa.

The long-run relationship between health spending as a share of gross domestic product (GDP) and education spending as a share of gross domestic product (GDP), which are selected as human capital proxies, and gross domestic product (GDP) per capita is estimated between the years 1926 and 1994 by Kar and Agir (2006). The long-run positive relationship between human capital indicators and gross domestic product (GDP) per capita is determined by co-integration test. Education spending leads to economic growth. Also, economic growth leads to health spending, by the result of causality analysis.

In the study of Taban and Kar (2006), the effect of human capital index, which combines enrollment ratio, education index and life expectancy that is based on Human Capital Report which is issued by UNDP, on real gross domestic product (GDP) is examined over the period 1969-2001. The long-run relationship between human capital indicators and economic growth is detected as the consequences of co-integration and causality analysis. Human capital indicators contribute to economic growth positively. On the other hand, mutual interrelationship exists.

The relationship between enrollments rate in primary school, secondary (junior high school) school, high school besides higher education (university), and economic growth is examined between 1937 and 1996 by co-integration and Granger causality test by Sari and Soytas (2006). Co-integration relationship among the education variables and economic growth is detected. An increase in the level of education has significant effect on economic growth. However, their Granger causality test results show that even though enrollment rate in primary school affects real gross domestic product (GDP) in the long-run, the short-term effect of enrollment rate in primary school is not significant. Secondary (junior high school) school, high school and higher education enrollment rates have significant impacts on real gross domestic product (GDP) in both the short-term and the long-term.

In the study of Taban (2006), the health dimension of human capital is examined. The causal relationship between human capital and economic growth in Turkey is analyzed from the year 1968 to 2003. Life expectancy at birth, the number of bed in hospitals, the number of health institutions, the number of person per healthcare personnel are used as proxies of human capital. In the short-run, while increases in life expectancy at birth and the number of bed in hospitals affect economic growth positively, a decrease in the number of person per healthcare personnel impacts economic growth positively. Additionally, as the causal relationship between other three health indicators and economic growth is determined, no causal relationship between the number of health institutions and economic growth is found. He explains that the number of health institutions is insufficient for population in Turkey.

Altug et al. (2008) searches the sources of economic growth in Turkey between 1880 and 2005. The effect of total factor productivity on economic growth is examined by growth accounting analyses of the Solow model and the Augmented Solow model. The share of human capital is equalized to zero before the period 1930, and it is taken as 0.15 after the period 1930. The average years of schooling of labor force, aged 15-64, is selected as a proxy of human capital. This proxy is available in five-year intervals after 1935. Their results are that capital accumulation after the period 1930 is the main source of the growth rate of output. The growth accounting analysis of the Augmented Solow model shows that the contribution of total factor productivity growth on output growth increases through human capital. The contribution of human capital on growth rate decreases between 1930 and 2005. The amount of its contribution on growth is 0.60, 0.41 and 0.37 per cent, respectively.

Ay and Yardimci (2008) use gross domestic product (GDP) per capita, total investment as a share of gross domestic product (GDP) and human capital between 1950 and 2000 in order to analyze the relationship between these variables. The number of students on high school and higher education are chosen as human capital proxies. As a consequence of co-integration test, there is the long-run relationship between higher education and gross domestic product (GDP) per capita. To the contrary, any long-run relationship among high school and gross domestic product (GDP) per capita is not found. According to Ay and Yardimci (2008), this result of the analysis should be interpreted as the short-term and the medium-term. Also, they highlighted that the significant effect of high school on gross domestic product

(GDP) per capita is limited through increasing the productivity of physical capital. Additionally, human capital has an impact on both physical capital, which is measured by total investment as a share of gross domestic product (GDP), and gross domestic product (GDP) per capita positively.

Ismihan and Metin-Ozcan (2009) explore sources of growth in Turkey between 1960 and 2004 besides two sub-periods (pre-1980 and post-1980) by growth accounting analysis. Educational attainment per worker is selected as a proxy of human capital. Their findings reveal that the main source of growth of output per worker is physical capital accumulation, and its contribution is 66 per cent between 1960 and 2004. Further, total factor productivity and human capital accumulation contribute about 20 per cent and 15 per cent, respectively. Moreover, the contribution of human capital between the first sub-period 1960 and 1980 is 15.4 per cent, and its contribution in second sub-period, 1980- 2004, is 14.2 per cent.

Simsek and Kadilar (2010) explore the causal relationship between the accumulation of human capital, export and growth from the year 1960 to 2004. This relationship is analyzed by using annual real gross domestic product (GDP), real export and the amount of higher education registration by the co-integration method and error correction model. As a result of their findings, increases in human capital and export lead to increase economic growth in the long-run. On the other hand, economic growth contributes to human capital.

Yaylali and Lebe (2011) search a relationship between human capital and economic growth between 1938 and 2007 in Turkey. The total number of students in primary school, secondary school and higher education are chosen to calculate human capital. As a result of the analysis of co-integration and vector autoregression, the long-run relationship is found. The level of primary school has more effect on economic growth by testing causality. Moreover, human capital contributes to a change in economic growth each passing year.

4. HUMAN CAPITAL IN TURKEY AND OTHER OECD COUNTRIES

The rate of the population below age 15 in Turkey is one of the largest youth populations among the OECD countries (OECD, 2013, p. 4). Most developed countries desire to have young population over years. The higher welfare is attainable through healthy and well-educated young population, which has already existed in Turkey. Each of the highly qualified people will impact on Turkey's future substantially. As the well-educated and healthy individuals take part in labor market, the processes of economic growth and development will be benefitted from these individuals for a long time. In this part of thesis, some indicators of human capital like education and health in consideration of the literature are viewed for Turkey and other OECD countries.

4.1 Education in Turkey and Other OECD Countries

Education has been widely used to measure human capital. High level of net school enrollment rate across the developed countries has been preserved by 95 per cent. During the last two decades, transitional economies have slowly developed. However, the half of the gap of their school enrollment rates has been closed by developing countries compared to the developed countries (Hanushek, 2013, p.207).

Education system of Turkey, which is one of the developing countries and the OECD members, had consisted of primary school, taking 5 years, secondary school, taking 3 years, high school (general and vocational high school), taking 3 or 4 years, and higher education (university) until the year 1997. After 1997, basic education law¹, which combines primary school with secondary school, had been implemented until 2012. The duration of compulsory education became 8 years with the basic education law. The compulsory education has been renewed with new basic education law², and it is named "4+4+4" in 2012. Hence, the duration of compulsory education has increased to 12 years. The last basic education law, which is implemented in 2012,

¹ Law number is 4306.

² Law number is 6287.

divides the compulsory education into three parts as primary school, secondary school, and high school (general and technical high school). In this part, some of the education indicators are evaluated in Turkey and other OECD countries.

The literacy rate by sex by years in Turkey between 1935 and 2013 is shown in Figure 4.1. From 1935 to 2013, female literacy ratio has been lower than male literacy rate. The literacy rate in both genders had been decreasing between 1955 and 1960. The literacy rate levels off after 2000. The literacy rate levels off after 2000. In 2013, the literacy rate of male in Turkey attained to almost 100 per cent. However, both female literacy rate and male literacy rate have showed an increasing trend until 2013.

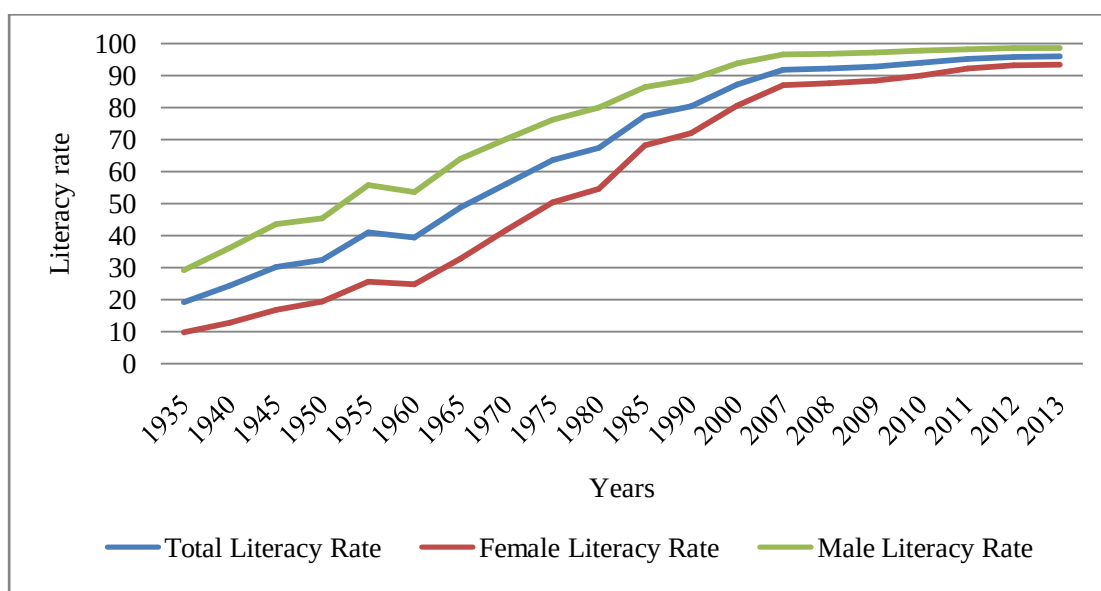


Figure 4.1 : Population by literacy rate (6 years of age & over) in Turkey
Source: TUIK, Census of Population.

Table 4.1 informs about Turkey's net schooling ratio by year and level of education between 1997 and 2011. All types of net schooling ratio in Turkey show an upward trend in general. Net schooling ratio in primary education, which includes primary school and secondary school, is almost 100 per cent in 2011. It is obvious that the meaning of 98.67 per cent in primary education is that most of the people in Turkey can read and write. The net schooling ratio in high school, which is consisted of general and vocational high school between 1997 and 2012, goes parallel with net schooling ratio in primary education in general.

Although the compulsory education (8-years) did not include higher education, net schooling ratio on higher education in 2011 is approximately four times higher than net schooling ratio on higher education in the year 1997.

Table 4.1 : Net schooling ratio by year and level of education in Turkey.

Years	Primary Education	HighSchool	Higher Education
1997	84.74	37.87	10.25
1998	89.26	38.87	10.76
1999	93.54	40.38	11.62
2000	95.28	43.95	12.27
2001	92.40	48.11	12.98
2002	90.98	50.57	14.65
2003	90.21	53.37	15.31
2004	89.66	54.87	16.6
2005	89.77	56.63	18.85
2006	90.13	56.51	20.14
2007	97.37	58.56	21.06
2008	96.49	58.52	27.69
2009	98.17	64.95	30.42
2010	98.41	66.07	33.06
2011	98.67	67.37	35.51

Source: TUIK, Education Statistics.

Table 4.2 demonstrates the rate of population in terms of the last completed formal education in Turkey from 1975 to 2013 (5-year interval). Although the duration of compulsory education in 2012 takes 12 years, the rate of population in 2013, which literates and graduated from primary school is almost similar to the rate of population in 1975, which completed primary school.

Table 4.2 : Formal education completed (population 25 years of age & over) in Turkey.

Years	Literate without diploma	Primary School	Secondary School	High School	Higher education	Master	Doctorate	Unknown
1975	8.9	34.7	3.3	3.9	1.8			0.2
1980	8.1	35.6	3.8	5	3.6			0.1
1985	8.8	44.5	4.6	6.9	3.9			0.1
1990	5.7	48.2	5.8	8.5	5.1			0.1
2000	6.4	47.8	8.2	12.5	7.8			0
2008	6.2	42.7	7	15.4	8.3	0.6	0.2	7.4
2009	5.7	43.7	6.8	16.1	9.2	0.7	0.2	5.4
2010	5.5	36.6	7.4	17.5	9.8	0.9	0.3	5.2
2011	6	35.3	6.6	18.3	11.1	0.9	0.3	3.8
2012	5.8	35.2	6	20.5	13	0.8	0.3	3.5
2013	6.6	33.5	6.3	18.2	12.9	1.2	0.3	3.4

Source: TUIK, Education Statistics.

The number of graduates in high school and over level increased considerably from the year 1975 to 2013. At least, these graduates may take part in labor market, and they contribute to their own earnings and firm's productivity compared to low level of education.

The Program for International Student Assessment (PISA) made by Organization for Economic Co-operation and Development (OECD) measures the performance of 15-year old students on reading, mathematics and science in the OECD member nations and non-member nations all over the world since the year 2000 (OECD, 2002). It is repeated every three years. Turkey joined PISA in 2003. PISA scores of Turkey and OECD average in terms of three types of performance in 2003, 2006, 2009 and 2012 are shown in Table 4.3³. Reading, mathematics and science performances in Turkey are lower than the performances of OECD in 2003, 2006, 2009 and 2012, except science performance in 2003 (missing data). The best performance is displayed for reading part in Turkey compared to the others.

Table 4.3 : PISA scores in Turkey.

Years	Reading Performance		Mathematics Performance		Science Performance	
	OECD Average	Turkey	OECD Average	Turkey	OECD Average	Turkey
2003	511.7	459.0	494.83	415.00	NA	NA
2006	508.6	471.0	488.59	421.00	497.12	430.00
2009	513.2	486.0	489.79	440.00	500.82	460.00
2012	515.4	498.6	488.55	443.95	500.41	468.62

Source: OECD (2015a, 2015b, 2015c), PISA Indicators.

Table 4.4 shows total education budget and the proportion of total education budget in GDP in Turkey from 1997 to 2014. The amount of total education budget shows an upward trend between 1997 and 2014. Total education budget in 2014 is a hundred times more than total education budget in 1997. The proportion of total education budget in GDP fluctuates between 1997 and 2014. Nevertheless, the share of total education budget in GDP grew over 70 per cent from 1997 to 2014.

³ Missing data are denoted as NA.

Table 4.4 : Total education budget and proportion of total education budget in GDP in Turkey.

Years	Total Education Budget (Thousand TL)	Proportion of total education budget in GDP(%)
1997	706 763	2.4
1998	1 635 534	2.3
1999	2 808 708	2.7
2000	4 396 875	2.6
2001	5 411 216	2.3
2002	9 956 959	2.8
2003	13 588 605	3.0
2004	16 748 713	3.0
2005	20 100 726	3.1
2006	22 414 968	3.0
2007	27 942 326	3.3
2008	30 233 850	3.2
2009	36 656 415	3.8
2010	37 592 870	3.4
2011	45 616 090	3.8
2012	51 912 982	3.6
2013	62 724 139	4.0
2014	72 643 827	4.2

Source: TUIK, Education Expenditures Statistics.

Table 4.5⁴ denotes net school enrollment rates in primary school and secondary school in the OECD countries between 2010 and 2013. Japan has the highest net primary school enrollment rate in 2010, 2011 and 2012 amongst the OECD countries with regards to World Bank (WB) data that are shown in the Table 4.5. As given data in Table 4.5, the United Kingdom has the highest primary school enrollment rate by 99.9 per cent in 2013. As the lowest net primary school enrollment rate (92.4 per cent) in 2010 is in Luxembourg, Hungary has the lowest net primary school enrollment rate (91.4 per cent) in 2013. While Greece and Iceland have the highest net secondary school enrollment rate by 99.2 per cent in 2010, the highest net secondary school enrollment rate is in Israel by 98.4 per cent in 2013. Mexico has the lowest net secondary school enrollment rate in 2010, 2011 and 2012 as regards to given data in Table 4.5. The second lowest net secondary school enrollment rate in 2010 is in Turkey by 81.1 per cent. According to Table 4.5, Australia has the lowest net secondary school enrollment rate in 2013.

⁴ Table 4.5 shows only available primary school and secondary school data of the OECD countries. Missing data are denoted as NA. Table 4.5 is interpreted by using available data.

Table 4.5 : Net school enrollment rate in primary school and secondary school in the OECD countries.

Country	2010		2011		2012		2013	
	Primary School (%)	Secondary School (%)	Primary School (%)	Secondary School (%)	Primary School (%)	Secondary School (%)	Primary School (%)	Secondary School (%)
Australia	96.5	85.2	96.4	85.6	96.8	85.3	97.4	85.7
Austria	NA	NA	NA	NA	NA	NA	NA	NA
Belgium	98.9	NA	98.8	NA	98.7	NA	98.3	96.4
Canada	NA	NA	NA	NA	99.1	NA	NA	NA
Switzerland	93.7	83.4	93.6	83.0	93.4	81.0	NA	NA
Chile	94.1	84.0	93.1	84.7	92.7	84.1	92.0	87.3
Czech Republic	NA	NA	NA	NA	NA	NA	NA	NA
Germany	97.6	NA	97.9	NA	97.9	NA	97.7	NA
Denmark	95.9	90.1	97.5	91.3	97.9	91.1	98.2	91.6
Spain	99.7	95.1	99.7	95.0	99.7	95.6	98.4	96.0
Estonia	94.8	94.2	94.2	93.0	94.7	90.7	94.8	89.2
Finland	97.8	93.6	98.2	93.0	98.8	92.4	99.1	94.0
France	98.5	95.6	98.3	95.8	98.2	96.7	98.5	97.5
Greece	99.5	99.2	99.5	NA	99.8	NA	NA	NA
Hungary	93.2	91.7	92.5	92.0	91.3	92.2	90.8	92.3
Ireland	95.2	99.2	98.8	NA	95.3	99.1	NA	NA
Iceland	98.7	89.6	98.5	88.4	98.1	88.7	NA	NA
Israel	97.1	97.9	96.7	98.1	97.3	97.7	96.9	98.4
Italy	97.7	93.9	97.2	91.9	96.4	91.3	NA	NA
Japan	99.9	99.0	99.9	99.1	99.9	99.1	NA	NA
Korea, Rep.	98.6	96.0	98.9	95.6	NA	NA	99.1	96.0
Luxembourg	92.4	86.5	92.1	86.5	92.3	85.7	NA	NA
Mexico	94.8	67.3	95.6	67.3	96.3	67.9	96.1	NA
Netherlands	99.7	87.8	99.7	89.2	98.4	90.2	97.0	92.2
Norway	98.9	95.7	99.3	95.5	99.4	94.9	99.7	95.1
New Zealand	99.3	94.7	99.1	96.7	98.4	97.0	97.9	97.4
Poland	96.3	90.8	96.3	90.4	96.6	90.5	96.8	92.1
Portugal	99.1	NA	98.8	NA	98.6	NA	95.7	95.2
Slovak Republic	NA	NA	NA	NA	NA	NA	NA	NA
Slovenia	97.2	92.9	97.2	93.2	97.7	93.3	97.2	94.4
Sweden	99.4	93.1	99.5	91.5	99.5	92.8	99.3	94.6
Turkey	97.1	81.1	96.2	84.7	94.0	82.1	94.9	88.3
United Kingdom	99.5	99.1	99.7	96.5	99.8	94.6	99.9	97.9
United States	92.6	86.8	91.9	87.5	91.8	86.9	91.4	NA

Source: World Development Indicators (WB, 2015a, 2015b).

Table 4.6 lists mathematics, reading and science mean scores in PISA of the OECD countries in terms of gender in 2012. As female, who live in Japan, has the highest mathematics mean score between the OECD countries, male in Korea has the highest mathematics mean score. The highest reading mean score for male is in Japan while female in Finland has the highest reading score. Moreover, female in Finland has the highest science score. However, the highest science mean score for male is in Japan. All mean scores in Turkey is below the OECD mean scores for both gender. The scores of female in Turkey are higher than male's scores, except mathematic score. In Table 4.6, mean scores of female and male in Mexico are the lowest mean score among the OECD countries. It can be clearly seen that the three types of mean scores in Turkey are one of the lowest scores amongst the OECD countries.

Table 4.7⁵ shows spending per student on pre-primary, primary and secondary school in 2010 and the share of public and private expenditure as a percentage of total expenditure in the OECD countries. The highest spending per student on pre-primary, primary and secondary school is in Luxembourg in 2010. Its expenditure per student on pre-primary and primary school is nearly three times higher than OECD's expenditure. Furthermore, Turkey's spending per student on pre-primary, primary school and secondary school is the lowest amount per student among the listed countries. Turkey's spending per student on pre-primary, primary and secondary school is almost three times, four times and five times lower than OECD's expenditure per student, respectively. It is obvious that most of the listed countries allocate significant share of their public sources as a percentage of total expenditure for education. 99.9 per cent of Sweden's total expenditure, which is the highest share among the countries, is sourced by public.

⁵ Missing data are denoted as NA. Table 4.7 is interpreted by using available data.

Table 4.6 : Mean scores by gender in PISA for the OECD countries.

Country	Mathematics scale				Reading scale				Science scale			
	Females		Males		Females		Males		Females		Males	
	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
Australia	498	2.0	510	2.4	530	2.0	495	2.3	519	2.1	524	2.5
Austria	494	3.3	517	3.9	508	3.4	471	4.0	501	3.4	510	3.9
Belgium	509	2.6	520	2.9	525	2.7	493	3.0	503	2.6	507	3.0
Canada	513	2.1	523	2.1	541	2.1	506	2.3	524	2.0	527	2.4
Chile	411	3.1	436	3.8	452	2.9	430	3.8	442	2.9	448	3.7
Czech Republic	493	3.6	505	3.7	513	3.4	474	3.3	508	3.5	509	3.7
Denmark	493	2.3	507	2.9	512	2.6	481	3.3	493	2.5	504	3.5
Estonia	518	2.2	523	2.6	538	2.3	494	2.4	543	2.3	540	2.5
Finland	520	2.2	517	2.6	556	2.4	494	3.1	554	2.3	537	3.0
France	491	2.5	499	3.4	527	3.0	483	3.8	500	2.4	498	3.8
Germany	507	3.4	520	3.0	530	3.1	486	2.9	524	3.5	524	3.1
Greece	449	2.6	457	3.3	502	3.1	452	4.1	473	3.0	460	3.8
Hungary	473	3.6	482	3.7	508	3.3	468	3.9	493	3.3	496	3.4
Iceland	496	2.3	490	2.3	508	2.5	457	2.4	480	2.9	477	2.7
Ireland	494	2.6	509	3.3	538	3.0	509	3.5	520	3.1	524	3.4
Israel	461	3.5	472	7.8	507	3.9	463	8.2	470	4.0	470	7.9
Italy	476	2.2	494	2.4	510	2.3	471	2.5	492	2.4	495	2.2
Japan	527	3.6	545	4.6	551	3.6	527	4.7	541	3.5	552	4.7
Korea	544	5.1	562	5.8	548	4.5	525	5.0	536	4.2	539	4.7
Luxembourg	477	1.4	502	1.5	503	1.8	473	1.9	483	1.7	499	1.7
Mexico	406	1.4	420	1.6	435	1.6	411	1.7	412	1.3	418	1.5
Netherlands	518	3.9	528	3.6	525	3.5	498	4.0	520	3.9	524	3.7
New Zealand	492	2.9	507	3.2	530	3.5	495	3.3	513	3.3	518	3.2
Norway	488	3.4	490	2.8	528	3.9	481	3.3	496	3.7	493	3.2
Poland	516	3.8	520	4.3	539	3.1	497	3.7	527	3.2	524	3.7
Portugal	481	3.9	493	4.1	508	3.7	468	4.2	490	3.8	488	4.1
Slovak Republic	477	4.1	486	4.1	483	5.1	444	4.6	467	4.2	475	4.3
Slovenia	499	2.0	503	2.0	510	1.8	454	1.7	519	1.9	510	1.9
Spain	476	2.0	492	2.4	503	1.9	474	2.3	493	1.9	500	2.3
Sweden	480	2.4	477	3.0	509	2.8	458	4.0	489	2.8	481	3.9
Switzerland	524	3.1	537	3.5	527	2.5	491	3.1	512	2.7	518	3.3
Turkey	444	5.7	452	5.1	499	4.3	453	4.6	469	4.3	458	4.5
United Kingdom	488	3.8	500	4.2	512	3.8	487	4.5	508	3.7	521	4.5
United States	479	3.9	484	3.8	513	3.8	482	4.1	498	4.0	497	4.1
OECD	489	0.5	499	0.6	515	0.5	478	0.6	500	0.5	502	0.6

Source: OECD Factbook 2014 (OECD, 2014b).

Table 4.7 : Spending per student and public and private sources as a percentage of total expenditure in the OECD countries.

Country	Spending per student, USD, 2010, PPPs			As a percentage of total expenditure	
	Pre-primary School	Primary School	Secondary School	Share of public sources	Share of private sources
	2010	2010	2010	2010	2010
Australia	8 899	9 463	10 350	84.69	15.3
Austria	8 893	10 244	12 551	95.47	4.52
Belgium	6 024	8 852	11 004	95.99	4.00
Canada	NA	8 933	NA	89.30	10.69
Chile	3 544	3 301	3 110	78.57	21.42
Czech Republic	4 247	4 120	6 546	90.82	9.17
Denmark	9 454	10 935	11 747	97.60	2.39
Estonia	2 533	5 140	6 444	98.70	1.29
Finland	5 372	7 624	9 162	84.69	15.3
France	6 362	6 622	10 877	92.02	7.97
Germany	NA	NA	NA	NA	NA
Greece	NA	NA	NA	NA	NA
Hungary	4 773	4 684	4 553	NA	NA
Iceland	8 606	9 482	7 841	97.61	3.78
Ireland	NA	8 384	11 380	95.94	4.05
Israel	3 910	5 758	5 616	92.35	7.64
Italy	7 177	8 296	8 607	96.61	3.38
Japan	5 550	8 353	9 957	93.03	6.96
Korea	6 739	6 601	8 060	78.52	21.47
Luxembourg	20 958	21 240	17 633	97.79	2.20
Mexico	2 280	2 331	2 632	82.71	17.28
Netherlands	7 664	7 954	11 838	86.88	13.11
New Zealand	11 495	6 842	8 170	87.38	12.61
Norway	6 610	12 255	13 852	NA	NA
Poland	5 737	5 937	5 483	93.79	6.20
Portugal	5 977	5 922	8 882	99.95	0
Slovak Republic	4 306	5 732	4 806	88.00	11.99
Slovenia	7 744	8 935	8 187	91.32	8.67
Spain	6 685	7 291	9 608	91.82	8.17
Sweden	6 582	9 987	10 185	99.94	0
Switzerland	5 186	11 513	14 972	88.05	11.94
Turkey	2 490	1 860	2 470	NA	NA
United Kingdom	7 047	9 369	10 452	78.90	21.09
United States	10 020	11 193	12 464	92.26	7.73
OECD	6 762	7 974	9 014	NA	9.07

Source: OECD Factbook 2014 (OECD, 2014b).

4.2 Health in Turkey and Other OECD countries

It is widely known that health level of population leads to increase the productivity of investment and the duration of this investment. Skilled labor force affects productivity in a negative way as long as it does not work because of health problem. When taking into consideration the length of life, a worker, who benefits from health services sufficiently, lives longer, and thus living long will increase the productivity and duration of education investments. So, education and health investment should not be separated. Additionally, the allocation of health resources plays a crucial role on growth because the misallocation of health resources could be harmful to growth (Kelly, 1997, p. 74).

Figure 4.2 demonstrates the number of individuals per healthcare personnel (physicians, dentists, nurses and midwives) in Turkey from the year 1971 and 2013. The number of individuals per all types of healthcare personnel shows a downward trend in general. However, the number of individuals per midwives increased between 1980 and 1983. This general downward trend could be sourced by the increasing amount of healthcare personnel.

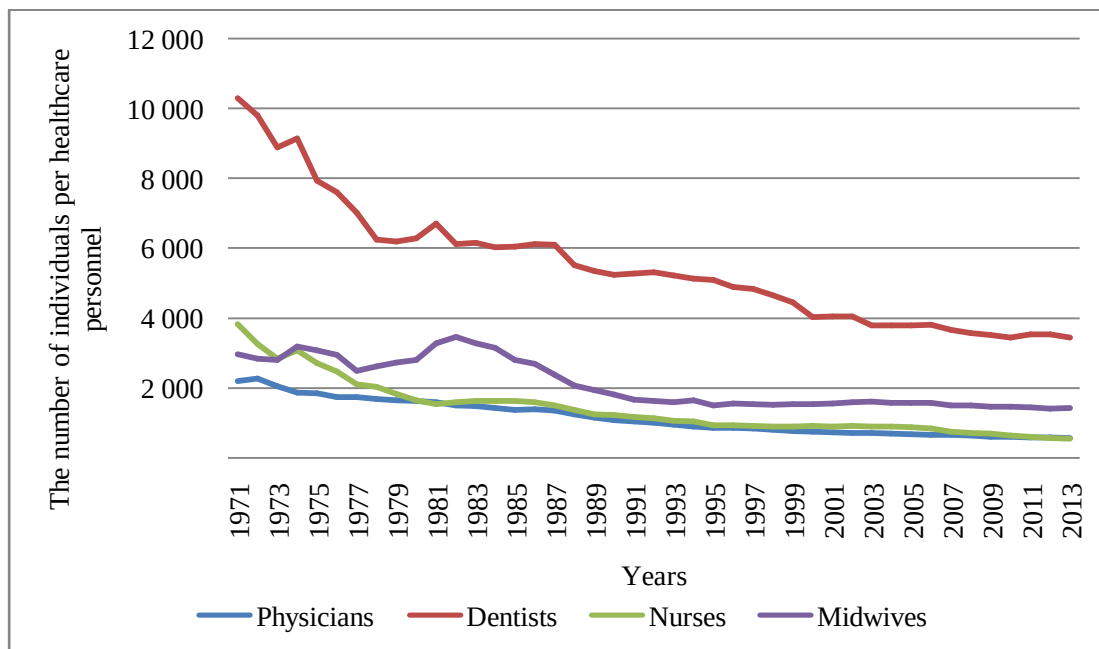


Figure 4.2 : The number of individuals per healthcare personnel in Turkey.
Source: TUIK, Health Statistics.

Total health expenditure and the proportion of total health expenditure to GDP in Turkey between 1999 and 2013 are shown in Table 4.8. Total health expenditure in Turkey increases nearly twenty-one times within 15 years. However, the share of total health expenditure to GDP went up slightly until 2009. After 2009, the proportion of health expenditure goes down slowly. The ratio of health expenditure to GDP in 2013 is equal to the fraction of expenditure rate to GDP in 2002, 2004 and 2005.

Table 4.8 : Total health expenditure and the proportion of total health expenditure to GDP in Turkey.

Years	Total health expenditure (Million TL)	Proportion of total health expenditure to gross domestic product (GDP) (%)
1999	4 985	4.8
2000	8 248	4.9
2001	12 396	5.2
2002	18 774	5.4
2003	24 279	5.3
2004	30 021	5.4
2005	35 359	5.4
2006	44 069	5.8
2007	50 904	6.0
2008	57 740	6.1
2009	57 911	6.1
2010	61 678	5.6
2011	68 607	5.3
2012	74 189	5.2
2013	84 390	5.4

Source: TUIK, Health Expenditure Statistics.

Table 4.9 shows life expectancy at birth of the OECD countries from 2003 to 2013. Life expectancy at birth of all OECD countries has increased between 2003 and 2013. While life expectancy at birth in most of the OECD countries is under 80 in 2003, this expectancy at birth attains over 80 in 2013. Japan has the highest life expectancy at birth in 2003 and 2013. As Estonia and Turkey in 2003 have the lowest life expectancy at birth by 71.3 and 71.6, the lowest life expectancy at birth in 2013 is in Hungary and Turkey by 75.3 and 75.2, respectively. Generally, as Turkey, which is one of the OECD countries, has low life expectancy at birth from 2003 to 2013, Japan, which is one of the OECD countries, has high life expectancy at birth between 2003 and 2013.

Table 4.9 : Life expectancy at birth of the OECD countries.

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Australia	80.2	80.5	80.8	81	81.3	81.4	81.5	81.7	81.9	82.0	82.2
Austria	78.6	79.2	79.3	79.9	80.2	80.4	80.3	80.6	81.0	80.9	80.9
Belgium	78.1	78.9	79.0	79.4	79.8	79.7	80.0	80.2	80.6	80.4	80.4
Canada	79.8	80.1	80.3	80.6	80.4	80.5	80.7	80.9	81.1	81.2	81.4
Chile	77.9	78.3	78.6	79	79.3	79.6	80.0	80.3	80.6	80.9	81.2
Czech Republic	75.2	75.7	75.9	76.5	76.7	77.0	77.1	77.4	77.9	78.1	78.3
Denmark	77.1	77.5	77.8	78.1	78.2	78.4	78.6	79.1	79.8	80.1	80.3
Estonia	71.3	71.9	72.6	72.7	72.8	73.8	74.8	75.4	76.2	76.3	76.4
Finland	78.4	78.7	78.8	79.2	79.3	79.6	79.7	79.9	80.5	80.6	80.8
France	79.1	80.2	80.2	80.8	81.1	81.2	81.4	81.7	82.1	82.0	82.0
Germany	78.4	78.7	78.9	79.1	79.5	79.7	79.8	80.0	80.7	80.9	81.0
Greece	78.8	79	79.2	79.4	79.4	79.9	80.2	80.4	80.7	80.6	80.6
Hungary	72.3	72.6	72.6	73.1	73.2	73.7	73.9	74.2	74.9	75.1	75.3
Iceland	81.0	81.0	81.5	81.2	81.5	81.6	81.8	81.9	82.4	82.9	83.1
Ireland	78.1	78.5	78.9	79.2	79.6	80.1	80.2	80.7	80.7	80.9	81.0
Israel	79.6	80.1	80.2	80.6	80.5	81.0	81.4	81.6	81.7	81.7	82.1
Italy	80.0	80.8	80.8	81.3	81.4	81.5	81.6	82.0	82.2	82.2	82.3
Japan	81.8	82.0	81.9	82.3	82.5	82.6	82.9	82.8	82.6	83.1	83.3
Korea, Rep.	77.3	77.8	78.4	79.0	79.3	79.8	80.3	80.6	81.0	81.2	81.5
Luxembourg	77.7	79.1	79.4	79.3	79.4	80.5	80.6	80.6	81.0	81.4	81.8
Mexico	74.9	75.1	75.3	75.4	75.6	75.7	75.9	76.0	76.2	76.4	76.5
Netherlands	78.5	79.1	79.3	79.7	80.1	80.3	80.5	80.7	81.2	81.1	81.1
New Zealand	79.1	79.5	79.9	80.0	80.2	80.4	80.7	80.7	80.9	81.2	81.4
Norway	79.4	79.8	80.0	80.3	80.4	80.6	80.8	81.0	81.3	81.5	81.5
Poland	74.6	74.8	75.0	75.1	75.2	75.5	75.7	76.2	76.7	76.8	76.8
Portugal	77.2	77.7	78.1	78.4	78.3	78.5	78.7	79.0	80.5	80.4	80.4
Slovak Republic	73.6	74.0	73.9	74.2	74.2	74.7	74.9	75.1	76.0	76.1	76.3
Slovenia	76.9	77.2	77.6	78.1	78.6	78.8	79.0	79.4	80.0	80.1	80.3
Spain	79.6	79.9	80.2	80.8	80.9	81.2	81.5	81.6	82.5	82.4	82.4
Sweden	80.1	80.5	80.5	80.7	80.9	81.1	81.4	81.5	81.8	81.7	81.7
Switzerland	80.5	81.1	81.2	81.5	81.7	82	82	82.2	82.7	82.7	82.7
Turkey	71.6	72.0	72.4	72.8	73.2	73.5	73.9	74.2	74.5	74.9	75.2
United Kingdom	78.4	78.7	79.0	79.2	79.4	79.6	80.1	80.4	81.0	80.9	81.0
United States	77.0	77.3	77.3	77.6	77.8	77.9	78.1	78.5	78.6	78.7	78.8

Source: World Development Indicators (WB, 2015c).

Table 4.10⁶ lists public and private expenditure on health as a percentage of GDP in the OECD countries in 1980, 1990 and 2000. The United States spent the highest total amount on health in 1980, 1990 and 2000 by 9 per cent, 12.4 per cent and 13.7 per cent, respectively. These proportions in 1990 and 2000 are nearly two times of OECD average's total spending.

⁶ Missing data are denoted as NA. Table 4.10 is interpreted by using available data

The proportion of total expenditures in Turkey in 1980, 1990 and 2000 were 2.4 per cent, 2.7 per cent and 4.9 per cent, respectively. The percentage of OECD average on total health expenditure is highly higher than the proportion of Turkey's total expenditure on health, as well.

Table 4.10 : Public and private expenditure on health as a percentage of GDP in the OECD countries.

Country	Public expenditure			Private expenditure			Total		
	1980	1990	2000	1980	1990	2000	1980	1990	2000
Australia	3.9	4.5	5.4	2.3	2.3	2.7	6.1	6.8	8.1
Austria	5.1	6.1	7.6	2.3	2.3	2.4	7.5	8.4	10
Belgium	NA	NA	6.1	0	0	2.1	6.3	7.2	8.1
Canada	5.3	6.6	6.2	1.7	2.3	2.6	7.0	8.9	8.8
Chile	NA	NA	3.4	0	0	3.1	NA	NA	6.4
Czech Republic	NA	4.3	5.7	0	0.1	0.6	NA	4.4	6.3
Denmark	7.9	6.9	7.3	1.1	1.4	1.4	8.9	8.3	8.7
Estonia	NA	NA	4.1	0	0	1.2	NA	NA	5.3
Finland	5.0	6.3	5.1	1.3	1.5	2.1	6.3	7.7	7.2
France	5.6	6.4	8.0	1.4	2.0	2.1	7.0	8.4	10.1
Germany	6.6	6.3	8.3	1.8	2.0	2.1	8.4	8.3	10.4
Greece	3.3	3.6	4.8	2.6	3.1	3.2	5.9	6.7	8.0
Hungary	NA	NA	5.1	0	0	2.1	NA	NA	7.2
Iceland	5.5	6.8	7.7	0.7	1.0	1.8	6.3	7.8	9.5
Ireland	6.7	4.3	4.6	1.5	1.7	1.5	8.1	6.0	6.1
Israel	NA	NA	4.7	0	0	2.8	7.7	7.1	7.5
Italy	NA	6.1	5.8	0	1.6	2.0	NA	7.7	7.9
Japan	4.5	4.5	6.1	1.8	1.3	1.5	6.4	5.8	7.6
Korea	0.8	1.5	2.2	2.8	2.3	2.1	3.6	3.9	4.3
Luxembourg	4.8	5.0	6.4	0.4	0.4	1.1	5.2	5.4	7.5
Mexico	NA	1.8	2.4	0	2.6	2.7	NA	4.4	5.1
Netherlands	5.1	5.4	5.0	2.3	2.6	2.9	7.4	8.0	8.0
New Zealand	5.1	5.6	5.9	0.7	1.2	1.7	5.8	6.8	7.6
Norway	5.9	6.3	6.9	1.0	1.3	1.5	7.0	7.6	8.4
Poland	NA	4.4	3.9	0	0.4	1.7	NA	4.8	5.5
Portugal	3.3	3.7	6.2	1.8	2.0	3.1	5.1	5.7	9.3
Slovak Republic	NA	NA	4.9	0	0	0.6	NA	NA	5.5
Slovenia	NA	NA	6.1	0	0	2.1	NA	NA	8.3
Spain	4.2	5.1	5.2	1.1	1.4	2.0	5.3	6.5	7.2
Sweden	8.2	7.4	6.9	0.7	0.8	1.2	8.9	8.2	8.2
Switzerland	NA	4.2	5.5	0	3.8	4.4	7.2	8.0	9.9
Turkey	0.7	1.6	3.1	1.8	1.1	1.8	2.4	2.7	4.9
United Kingdom	5.0	4.9	5.6	0.6	1.0	1.5	5.6	5.8	7.0
United States	3.7	4.9	5.9	5.3	7.5	7.8	9.0	12.4	13.7
OECD	4.8	5.0	5.5	1.1	1.5	2.2	6.6	6.9	7.8

Source: OECD Factbook 2014 (OECD, 2014b).

4.3 Human Capital Index of Turkey and Other OECD countries

The Human Capital Report was issued by World Economic Forum in 2013. This report shows human capital index for 122 countries. This index comprises of four different pillars; education, health and wellness, workforce and employment, and enabling environment. The education pillar consists of three sub-pillars; access, quality and attainment. The health and wellness pillar contains four sub-pillars: survival, health, well-being and services. Participation, talent and training are the sub-pillars of the workforce and employment pillar. The enabling environment is designed by using the legal framework, infrastructure, collaboration and social mobility sub-pillars. Different type scales are used in order to determine index values of these four pillars. Z –score approach, which is used to standardize by preserving the distribution of the data, is beneficial to convert raw data into a common metric (World Economic Forum, 2013, pp. 4-9).

Table 4.11⁷ shows the ranks and scores of the OECD⁸ countries aspect of four pillars; education, health and wellness, workforce and employment, enabling environment. Also Table 4.11 informs the overall index ranks and scores for the OECD countries. As Switzerland, which is ranked 1st in terms of overall score, has the highest health and wellness, and workforce and employment scores, Finland, which its overall score is ranked 2nd, has the highest education and enabling environment scores between the OECD countries. Whilst the lowest score of Switzerland is in education pillar, Finland's lowest score is in health and wellness pillar between the pillars. As given Table 4.11, the overall score of Turkey is ranked 60th, and it is the lowest score amongst the OECD countries. While the highest score of Turkey is in enabling environment pillar, the lowest score is in the workforce and employment pillar across the pillars. The overall score of Mexico is ranked 58th, and its overall score is the second lowest score between the listed countries. As education score of Mexico is the lowest score, Hungary has the lowest health and wellness score between these countries. Table 4.11 shows that Greece has the lowest work and employment, and enabling environment scores amongst the OECD countries.

⁷ Missing data are denoted as NA.

⁸ Slovak Republic, which is one of the OECD members, is not included to The Human Capital Report.

Table 4.11 : Human capital index for the OECD countries.

Country	Overall		Education		Health and Wellness		Workforce and Employment		Enabling Environment	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Switzerland	1	1.455	4	1.313	1	0.977	1	1.736	2	1.793
Finland	2	1.406	1	1.601	9	0.844	3	1.250	1	1.926
Netherlands	4	1.161	7	1.106	4	0.901	8	1.150	4	1.484
Sweden	5	1.111	14	0.977	2	0.960	6	1.154	10	1.351
Germany	6	1.109	19	0.888	8	0.877	9	1.149	3	1.522
Norway	7	1.104	15	0.970	6	0.890	5	1.182	8	1.373
United Kingdom	8	1.042	10	1.031	17	0.682	10	1.072	7	1.384
Denmark	9	1.024	18	0.891	3	0.943	12	0.932	11	1.330
Canada	10	0.987	2	1.355	20	0.548	15	0.875	17	1.168
Belgium	11	0.985	6	1.191	11	0.780	21	0.673	14	1.296
New Zealand	12	0.978	5	1.204	15	0.743	17	0.804	18	1.163
Austria	13	0.977	25	0.713	7	0.886	14	0.886	6	1.424
Iceland	14	0.957	8	1.075	5	0.900	16	0.826	20	1.026
Japan	15	0.948	28	0.628	10	0.836	11	1.027	13	1.302
United States	16	0.920	11	1.027	43	0.239	4	1.235	16	1.181
Luxembourg	17	0.881	35	0.522	16	0.704	13	0.928	9	1.372
Australia	19	0.831	13	0.988	18	0.663	19	0.675	23	0.999
Ireland	20	0.824	9	1.033	25	0.516	22	0.645	19	1.103
France	21	0.746	22	0.776	14	0.744	25	0.520	24	0.943
Korea, Rep.	23	0.640	17	0.899	27	0.481	23	0.596	30	0.582
Israel	25	0.587	27	0.651	29	0.457	20	0.674	32	0.568
Estonia	27	0.571	20	0.862	22	0.536	39	0.142	26	0.745
Spain	29	0.465	31	0.590	12	0.778	70	-0.185	28	0.679
Portugal	30	0.453	37	0.411	23	0.532	34	0.243	29	0.624
Slovenia	32	0.445	21	0.825	26	0.516	41	0.106	38	0.332
Czech Republic	33	0.387	36	0.452	36	0.310	36	0.210	31	0.576
Chile	36	0.305	49	0.250	38	0.306	37	0.194	35	0.471
Italy	37	0.266	40	0.378	19	0.601	75	-0.243	39	0.329
Poland	49	0.087	42	0.376	47	0.173	63	-0.139	57	-0.064
Hungary	54	0.000	33	0.530	73	-0.064	77	-0.275	62	-0.190
Greece	55	-0.011	47	0.280	34	0.331	86	-0.365	71	-0.291
Mexico	58	-0.057	82	-0.291	56	0.074	48	0.011	53	-0.022
Turkey	60	-0.065	77	-0.220	51	0.117	83	-0.337	45	0.181
Slovak Republic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: World Economic Forum (2013), The Human Capital Report.

Figure 4.3 demonstrates the spread of human capital index scores in Turkey. It is obviously seen that education score, workforce and employment score in Turkey are lower than the scores of both upper-income economies and Europe and Central Asia countries. Additionally, these score of Turkey have negative sign. However, Turkey's scores in terms of health and wellness, and enabling environment are higher than upper-middle income economies' scores, and these scores have positive sign. Turkey's overall index is negative, and this score is between the overall scores of Europe and Central Asia and Upper-middle income economies.

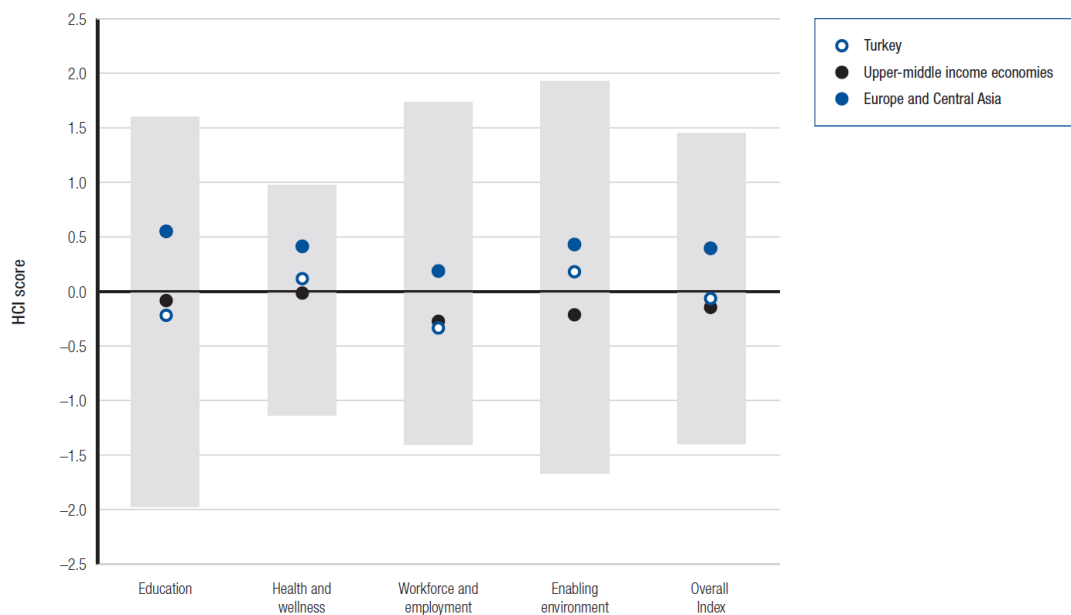


Figure 4.3 : Spread of Turkey's human capital index scores by pillars.
Source: World Economic Forum (2013), The Human Capital Report.

5. ECONOMETRIC ANALYSIS

5.1 Model

Mankiw et al. (1992) revised the Solow model by adding a human capital variable. The model is appropriate for the thesis to determine the long-run relationship between human capital and economic growth. Following to Mankiw et al. (1992), equation 5.1⁹ below is estimated in the thesis:

$$y_t = \alpha_0 + \alpha_1 k_t + \alpha_2 h_t + \varepsilon_t \quad (5.1)$$

By taking natural logarithms of both sides:

$$\ln y_t = \alpha_0 + \alpha_1 \ln k_t + \alpha_2 \ln h_t + \varepsilon_t \quad (5.2)$$

where α_0 is the constant term and ε_t is white noise residual term at the time t . $\ln y_t$ is the natural logarithm of GDP (1998 constant prices) per labor at the time t . The natural logarithm of capital stock per labor is denoted by $\ln k_t$ and the natural logarithm of human capital index at the time t is characterized by $\ln h_t$.

In calculating human capital index, the school enrolment rates, total or public expenditures on education, the share of education expenditure to gross domestic product (GDP), the number of graduates, the number of students, literacy rate, the number of scientists, engineers and technicians, job training, the scores of science, mathematics and reading performance as education indicators can be used. However, human capital does not match merely education. In addition to education, other factors like health, the number of population and brain drain, which affect accumulation of human capital, can be used as proxies. In the thesis, education and health dimensions besides socio-cultural dimension are examined. The number of students in primary education, high school (general and vocational high school) and higher education (university), high school (general and vocational high school) enrollment rate (%), higher education (university) enrollment rate (%), public spending on health as a share of gross domestic product (GDP), total spending on

⁹ Technology is given exogenously.

health as a share of gross domestic product (GDP), life expectancy at birth, the number of health institution per person, the number of bed in hospitals per person, the number of healthcare personnel (physicians, dentists, nurses, midwives, pharmacists, health officers) per person, the number of newspaper per person, the number of library per person, the number of book per person, telephone line per person are used for human capital indicators.

The first step is that the stationarity levels of all variables are checked individually. Ng-Perron (2001) test is used for this process. The second step, Johansen (1988) cointegration test is employed in order to determine the existence of the co-integration relationship amongst the main variables¹⁰. The last step of econometric analysis is that the effect of capital stock per labor and human capital index on gross domestic product (GDP) per labor is estimated by Generalized Method of Moments (GMM) (Hansen, 1982) between 1980 and 2013. All of the analysis is calculated by E-views 9.0 program.

5.1.1 The calculation of capital stock

Following Nehru and Dhareshwar (1993), Onder et al. (2003), Hulten and Isaksson (2007), capital stock in this thesis is calculated by Perpetual Inventory Method (PIM) by using equation 5.3:

$$K_{t+1} = (1 - d)K_t + I_t \quad (5.3)$$

where capital stock at time t is represented by K_t , depreciation rate is shown as d that is between 0 and 1, I_t denotes capital investment at time t . The stock of capital (K_{t+1}) at time $t + 1$ is equal to depreciated residual part of capital stock from previous year, $((1 - d)K_t)$, plus new real capital investment (I_t) at time t .

By substituting backward in time to some initial period, equation 5.3 can be figured in terms of the depreciated stream of investment plus the initial capital stock, K_0 :

$$K_t = (1 - d)^t K_0 + \sum_{f=1}^t (1 - d)^{t-f} I_f \quad (5.4)$$

The data of capital investment are used as 1998 constant prices in order to calculate the capital stock. Following to Nehru and Dhareshwar (1993), Onder et al. (2003), depreciation rate is determined 0.05. The value of depreciation rate is widely

¹⁰ The meaning of the main variables is that all econometric analysis is done by these variables (lny, lnk, lnh).

depended on average service values of capital assets. The depreciation rate of the OECD countries is 0.05 that is used by Turkey.

An initial value of capital stock can be calculated on the basis of steady state capital-output ratio in Turkey. The following equation (5.5) shows the steady state benchmark value:

$$c = \left(\frac{i}{g+d} \right) \quad (5.5)$$

where c is the capital-output ratio (K/Y), g is the growth rate of output (GDP), and i is the investment rate (I/Y). The steady state growth of output (g) and the investment rate (i) are calculated from the annual averages over 10 years which covers between 1970 and 1979. Inserting g and i into equation 5.5 gives c value and multiplying c by initial GDP gives the benchmark value. Following, 10 years of investment is added to the benchmark value and it marks the initial capital stock, K_0 (Hulten and Isaksson, 2007, p. 42).

5.1.2 The calculation of human capital index

Following Dreher (2006), the raw data are transformed into index values between zero and ten by using the formulas (5.6 and 5.7) below:

$$E_t = \left(\frac{V_t - V_{min}}{V_{max} - V_{min}} \right) * 10 \quad (5.6)$$

$$E_t = \left(\frac{V_{max} - V_t}{V_{max} - V_{min}} \right) * 10 \quad (5.7)$$

where E_t represent the index value at year t , V_t is the raw data for the year t , V_{max} and V_{min} are the maximum and minimum values of each indicator that represents human capital between the interval. As the first formula (5.6) means that the higher values are, the higher human capital is, the second formula (5.7) is that the higher values are, the less human capital is. All components of human capital are aggregated by unweighted average to get the human capital index.

5.2 Data

The data of gross domestic product (GDP) (1998 constant prices) and gross capital investment (1998 constant prices) to calculate capital stock from the year 1980 to 2013 are obtained from Turkish Statistical Institute (TUIK) and Republic of Turkey Ministry of Development. To calculate GDP per labor and capital stock per labor, labor data is collected from Republic of Turkey Ministry of Development.

Human capital index consists of fifteen different indicators. These variables can be clustered as education index, health index and socio-cultural index. Education index includes five indicators: the number of students in primary education, high school and higher education (university), high school enrollment rate (%) and higher education (university) enrollment rate (%). The number of students in primary education, high school and higher education are obtained from Republic of Turkey Ministry of National Education (MEB), Measuring, Selection and Placement Centre (ÖSYM), Turkish Statistical Institute (TUIK) and Turkish Higher Education Institution (YÖK). High school enrollment rate (%) and higher education (university) enrollment rate (%) are obtained from Republic of Turkey Ministry of National Education (MEB) and Turkish Statistical Institute (TUIK).

Health index consists of six indicators: public spending on health as a share of gross domestic product (GDP), total spending on health as a share of gross domestic product (GDP), life expectancy at birth, the number of health institution per person, the number of bed in hospitals per person, the number of healthcare personnel per person. The data of public spending on health as a share of gross domestic product (GDP) and total spending on health as a share of gross domestic product (GDP) are collected from Organization for Economic Co-operation and Development (OECD). Life expectancy at birth is collected from World Bank (WB). The data of the number of health institution, bed and healthcare personnel are obtained from Turkish Statistical Institute (TUIK). Total population data to calculate the number of health institution, bed and healthcare personnel per person are obtained from Organization for Economic Co-operation and Development (OECD).

Socio-cultural index, which is about culture and infrastructure, includes four indicators: the number of newspaper per person, the number of library per person, the number of book per person, telephone line per person.

The data of the number of newspaper, library and book are obtained from Turkish Statistical Institute (TUIK). The data of telephone line are collected from World Bank (WB). Total population data to calculate the number of newspaper, library, book, and telephone line per person are obtained from Organization for Economic Co-operation and Development (OECD).

Table 5.1 shows names, sources and abbreviations of the variables. Table 5.2 demonstrates descriptive statistics of the variables as well as education index, health index and socio-cultural index. According to Jarque-Bera test results, GDP per labor, capital stock per labor, human capital index, education index, health index and socio-cultural index are normally distributed. Capital stock per labor is the highest standard deviation between the main variables. Socio-cultural index are the lowest standard deviation amongst clustered variables.

Table 5.1 : List of the main variables and their sources.

Variables		Sources	Abbreviation
Gross domestic product per labor		Turkish Statistical Institute (TUIK) Republic of Turkey Ministry of Development	<i>lny</i>
Capital stock per labor		Turkish Statistical Institute (TUIK) Republic of Turkey Ministry of Development	<i>lnk</i>
Human capital index	Education index	Turkish Statistical Institute (TUIK) Measuring, Selection and Placement Centre (ÖSYM) Republic of Turkey Ministry of National Education (MEB) Turkish Higher Education Institution (YÖK)	<i>lnh</i>
	Health index	Turkish Statistical Institute (TUIK) Organization for Economic Cooperation and Development (OECD) World Bank (WB)	
	Socio-cultural index	Turkish Statistical Institute (TUIK) World Bank (WB)	

Notes: Gross domestic product per labor, capital stock per labor and human capital index are used by taking their natural logarithms. The natural logarithm is shown by *ln*.

Table 5.2 : Descriptive statistics of the variables.

	Y	K	H	Education Index	Health Index	Socio-cultural Index
Mean	3177.78	7097.91	4.14	3.92	4.23	4.31
Median	3128.62	6901.54	3.57	2.96	3.36	4.70
Maximum	4380.66	10667.34	8.89	9.95	9.25	7.34
Minimum	1948.19	3934.65	0.50	0.00	0.47	0.48
Std.Deviation	767.04	2207.04	2.64	2.69	3.04	2.16
Skewness	0.17	0.13	0.25	0.58	0.28	-0.19
Kurtosis	1.80	1.60	1.78	2.43	1.61	1.67
Jarque-Bera	2.21	2.86	2.48	2.41	3.18	2.69
Probability	0.33	0.23	0.28	0.30	0.20	0.26

Notes: GDP per labor, capital stock per labor and human capital index are denoted by Y, K, H.

5.2.1 Gross domestic product per labor

Gross domestic product (GDP) per labor is chosen as a dependent variable. GDP per labor is calculated by dividing gross domestic product (GDP) (1998 constant prices) with labor. Gross domestic product (GDP) per labor in Turkey between 1980 and 2013 are shown at Figure 5.1. There were severe crises in 1989-90¹¹, 1994¹², 1999¹³, 2001¹⁴ and 2008¹⁵ (Kibritcioglu, 2001; Akyuz and Boratav, 2003; “Türkiye’de Ekonomik Krizler”, n.d.). There is a sharp decrease in gross domestic product (GDP) per labor in the crises years (except 2008). However, the last economic crisis in 2008 affected Turkey’s economy in 2009 according to Figure 5.1. Generally, GDP per labor in Turkey shows an upward trend between 1980 and 2013.

¹¹ Gulf crisis

¹² Inflation reached a huge amount for the first time.

¹³ An earthquake occurred in Marmara region in 1999. Turkey’s economy was affected by the earthquake, considerably.

¹⁴ It is known as Black Wednesday.

¹⁵ The mortgage crisis occurred in the U.S. The effect of crisis spreads all around the world.

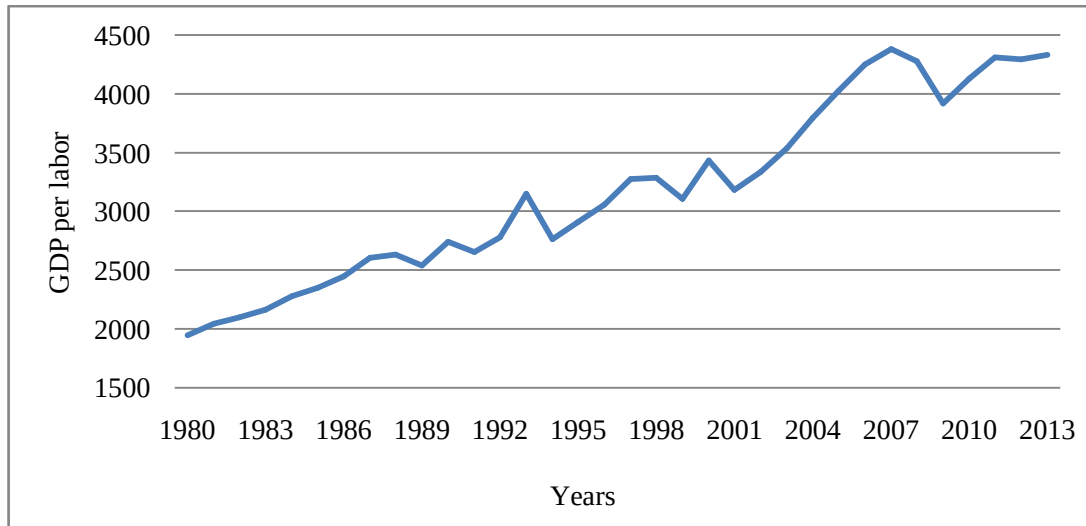


Figure 5.1 : Gross domestic product (GDP) per labor.

5.2.2 Capital stock per labor

Capital stock per labor is selected as one of the independent variables. Capital stock is calculated by Perpetual Inventory Method (PIM), and capital stock per labor is obtained by dividing capital stock with labor.

Figure 5.2 gives information about capital stock per labor in Turkey for the period from 1980 to 2013. Capital stock per labor increased slightly between 1980 and 1993. It can be clearly seen that there is a peak in 1993. However capital stock per labor dropped sharply with economic crisis in 1994. After 1994, there is a slow fluctuation between 1994 and 2013. In general, capital stock per labor in Turkey shows an upward trend between 1980 and 2013.

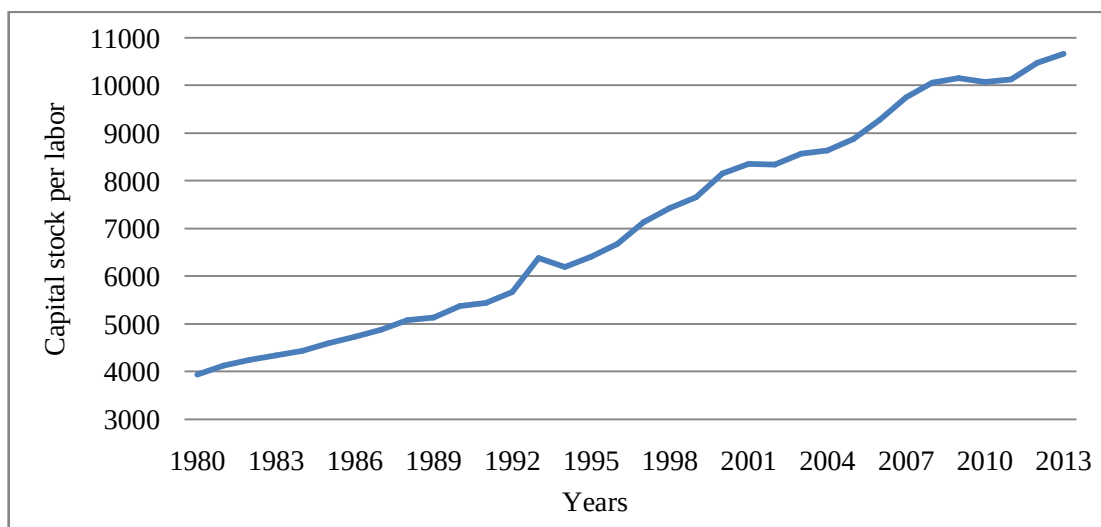


Figure 5.2 : Capital stock per labor.

5.2.3 Human capital index

Human capital index in the thesis consists of fifteen indicators. Human capital index is an unweighted average of these indicators, which are calculated by benefitting from the index formula of Dreher (2006). All indicators range from 0 to 10. So, human capital index ranges from 0 to 10, as well. Figure 5.3 shows human capital index in Turkey from 1980 to 2013. Until 1997, human capital index increased gradually. Human capital index decreased in 1997, 2001, 2006, 2008, and 2011. The economic crises in 2001 and 2008 would lead to decrease in these years. Nonetheless, human capital index rose up until 2013.

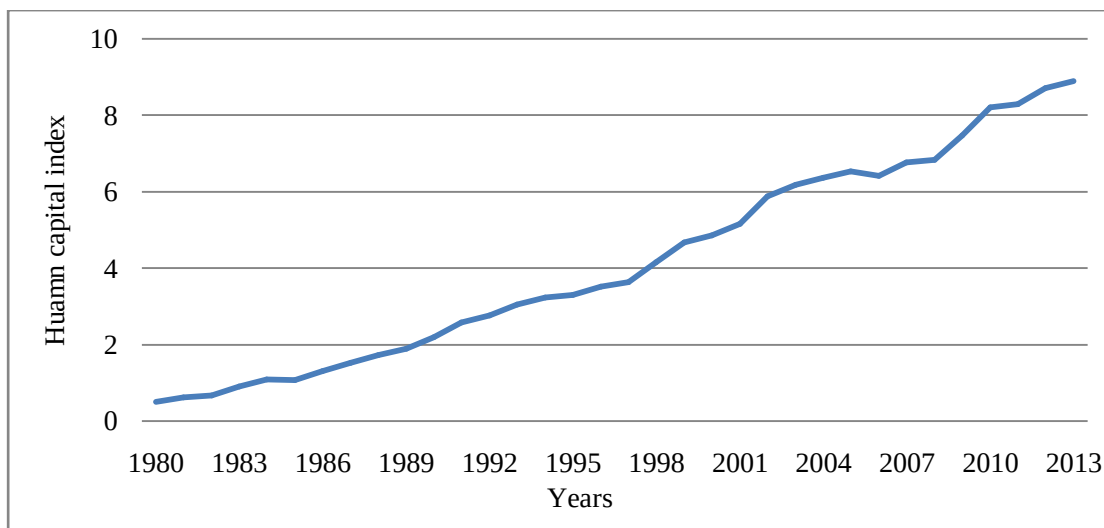


Figure 5.3 : Human capital index.

5.2.3.1 Education index

Education dimension of human capital index are examined by using the number of students in primary education, high school and higher education (university), high school enrollment rate (%) and higher education (university) enrollment rate (%).

Figure 5.4 demonstrates index values of high school and higher education enrollment rates in Turkey between 1980 and 2013. According to Figure 5.4, high school enrollment rate index has a considerable fluctuation between 1980 and 2013. There are two main sharp decreases in high school enrollment rate index between 2007 and 2009 besides 1996 and 1997. Additionally, higher education enrollment rate index decreased between 2007 and 2009. Nevertheless, both indices reached their top values in 2013.

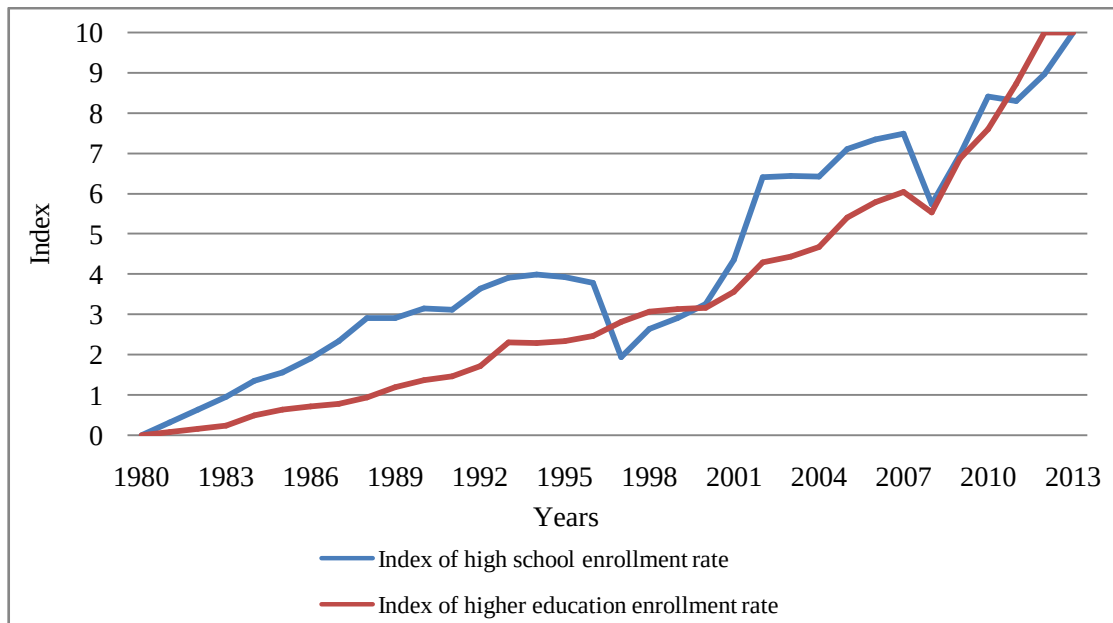


Figure 5.4 : Indices of high school enrollment rate and higher education enrollment rate.

Figure 5.5 shows index values of the number of students in primary education, high school and higher education in Turkey between 1980 and 2013. Index of the number of student in primary education decreased considerably between 1991 and 1996. However, there is a significant increase from the year 1996 to 1999. Index of the number of student in high school shows an upward trend with fluctuation during the period.

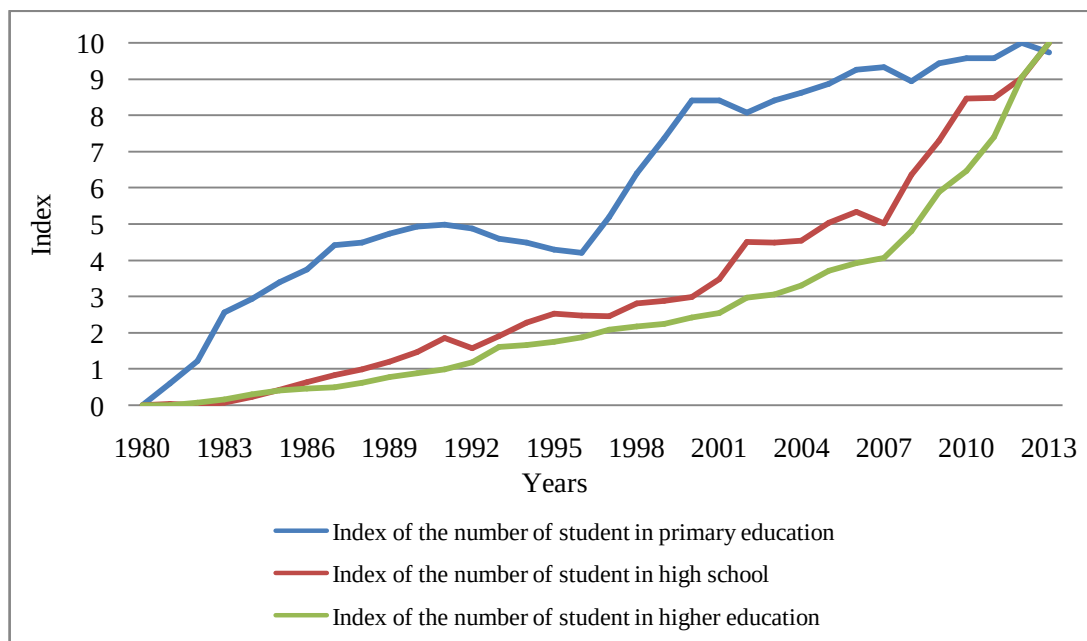


Figure 5.5 : Indices of the number of students in primary education, high school and higher education.

The duration of compulsory education increased to 8 years with the basic education law in Turkey in 1997. This law may encourage people, who live in Turkey, to enroll in high school. Index of the number of student in higher education always shows an upward trend with soft fluctuation. All indices in Figure 5.5 decreased slowly around the years 2007 and 2008. Nonetheless, these indices have started to reach their top values after 2010.

Figure 5.6 shows education index that consists of the mentioned indices above. There are two main decreases in education index in 1997 and 2008. Especially, education index went up after 2008, and it reached its top value in 2013.

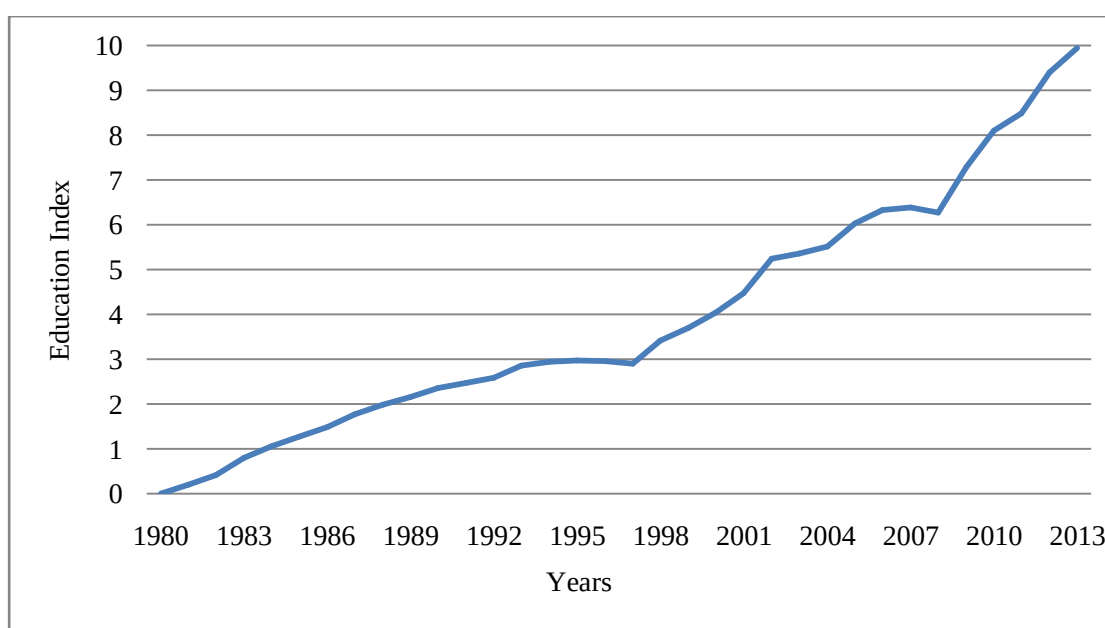


Figure 5.6 : Education index.

5.2.3.2 Health index

Health dimension of human capital index are expressed by public spending on health as a share of gross domestic product (GDP), total spending on health as a share of gross domestic product (GDP), life expectancy at birth, the number of health institution per person, the number of bed in hospitals per person, and the number of healthcare personnel per person.

Figure 5.7 demonstrates index values of public spending and total spending on health as a share of gross domestic product (GDP) in Turkey between 1980 and 2013. Generally, total spending on health as a share of GDP is higher than public spending until 2000. However, the share of public spending on health increased after 2000.

The index values of public spending are higher than index of total health spending. A possible explanation is that private spending on health might be decreased after 2000.

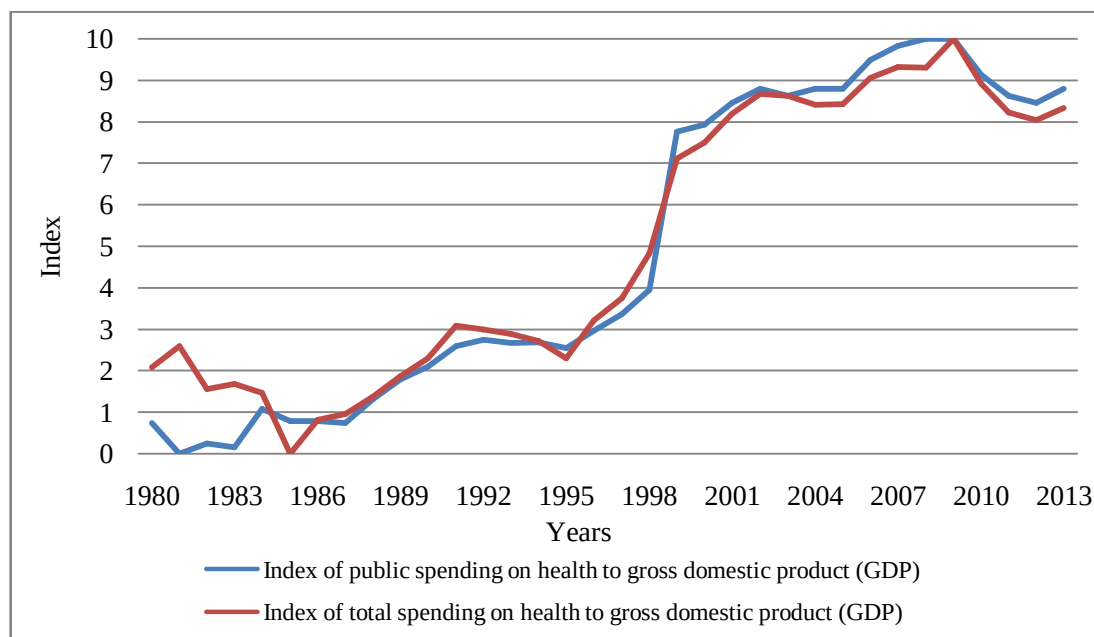


Figure 5.7 : Indices of public spending and total spending on health as a share of gross domestic product (GDP).

Figure 5.8 informs about index of life expectancy at birth in Turkey from 1980 to 2013. Index of life expectancy at birth has an upward trend from 1980 to 2013. Index of life expectancy at birth increased considerably between 1980 and 2011 without any fluctuation. After 2011, this index grew rapidly.

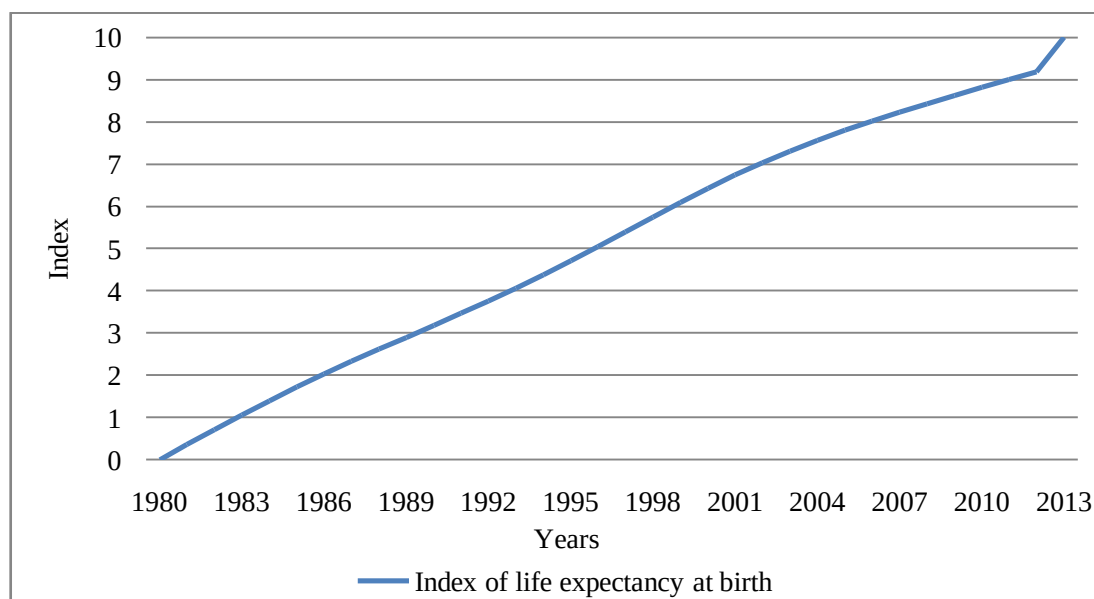


Figure 5.8 : Index of life expectancy at birth.

Index values of the number of health institution, bed, and healthcare personnel per person in Turkey are given at Figure 5.9 for the period from 1980 to 2013. Index of the number of health institution per person remained stable between 1980 and 1999. Afterwards, this index increased suddenly between 1999 and 2000. After 2000, it shows a downward trend until 2005. However, it increased considerably until 2012. Index of the number of bed per person decreased suddenly between 1980 and 1982. Until 1999, this index increased slightly. Then, there is a dip in 1999. However, this index reached its peak in 2002. There is a second peak for this index in 2010. This peak is the maximum value of the number of bed per person. Index of the number of healthcare personnel per person fluctuates in the period. The index attained its top value in 2013.

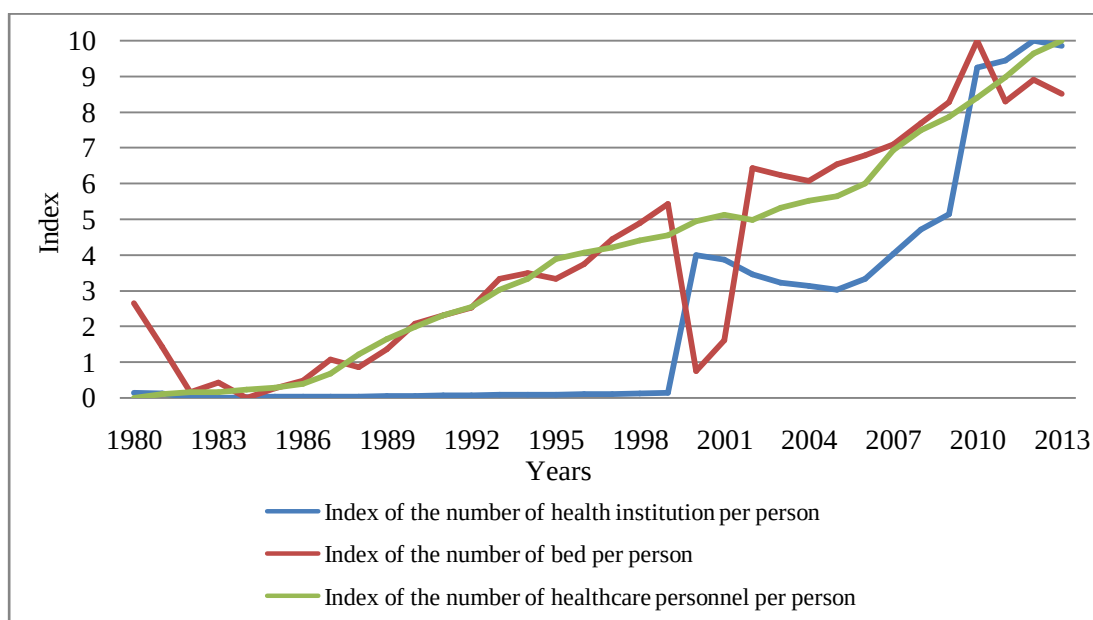


Figure 5.9 : Indices of the number of health institution, bed and healthcare personnel per person.

Figure 5.10 shows health index that consists of the mentioned indices above. Health index decreased between 1980 and 1985. This index increased gradually between until 2012. It can be clearly seen that health index fluctuated slowly between 1980 and 2013. There are three main peaks in 1999, 2002 and 2010. Index of health reached its maximum value in 2013.

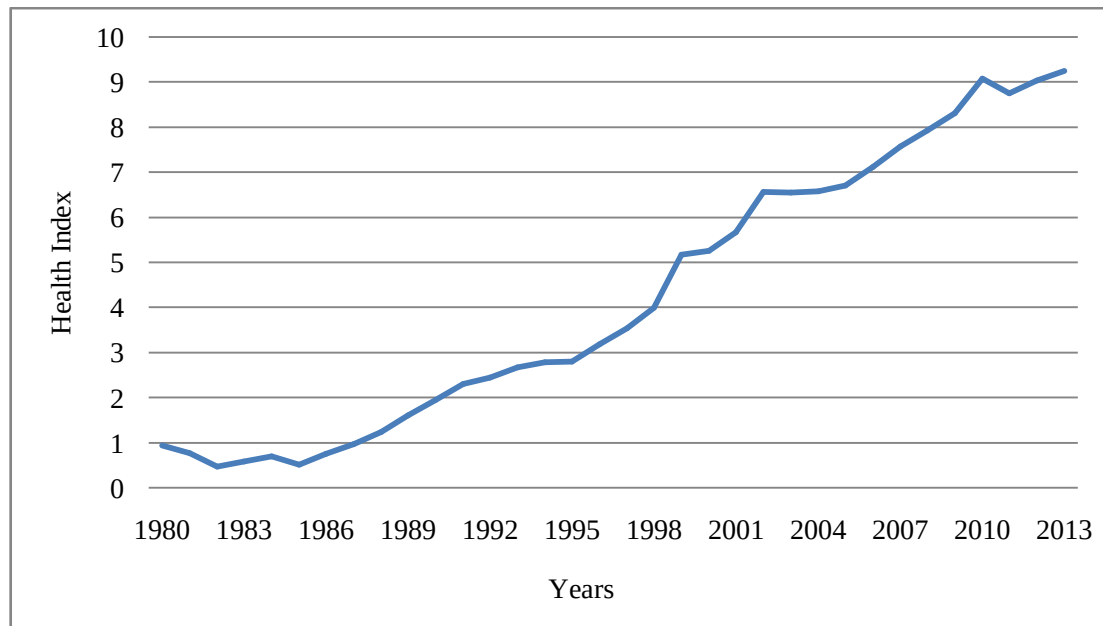


Figure 5.10 : Health index.

5.2.3.3 Socio-cultural index

Socio-cultural dimension of human capital index is presented by using the number of newspaper per person, the number of library per person, the number of book per person, telephone line per person.

Figure 5.11 gives information about indices of the number of newspaper per person, the number of library per person, the number of book per person in Turkey from 1980 to 2013. These three indicators can be named as cultural dimension of human capital index. All indices at Figure 5.11 fluctuated widely from 1980 to 2013. Index of the number of newspaper per person shows a downward trend from 1980 to 1999 with a fluctuation. Then, this index reached a peak in 2004. The following year, there is a sharp decrease. Until 2013, this index increased considerably. Index of the number of library per person increased significantly between 1980 and 2001. However, this index started to decrease until 2013. Index of the number of book per person decreased slowly between 1980 and 1995. As this index started to increase slightly until 2004, it reached its peak suddenly in 2004. There is a u-shape between 2004 and 2010. In general, the index movements of the number of newspaper and book per person are almost similar. The fluctuations of these indices would be sourced by advanced technology because technology would affect people's preferences. To illustrate, many people would start to read E-book and E-newspaper.

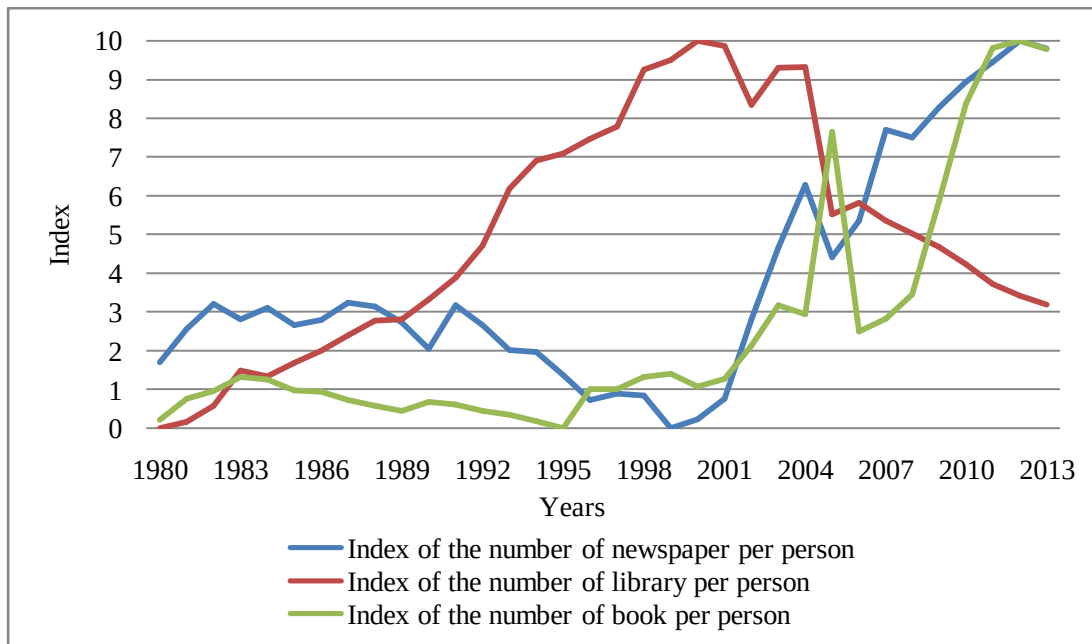


Figure 5.11 : Indices of the number of newspaper, library and book per person.

Figure 5.12 shows index of telephone line per person in Turkey between 1980 and 2013. While the index increased slowly between 1980 and 1989, it rose rapidly from 1989 to 1995. There is a fluctuation between 1995 and 2005. Then, index of telephone line per person started to decreased up until 2013.

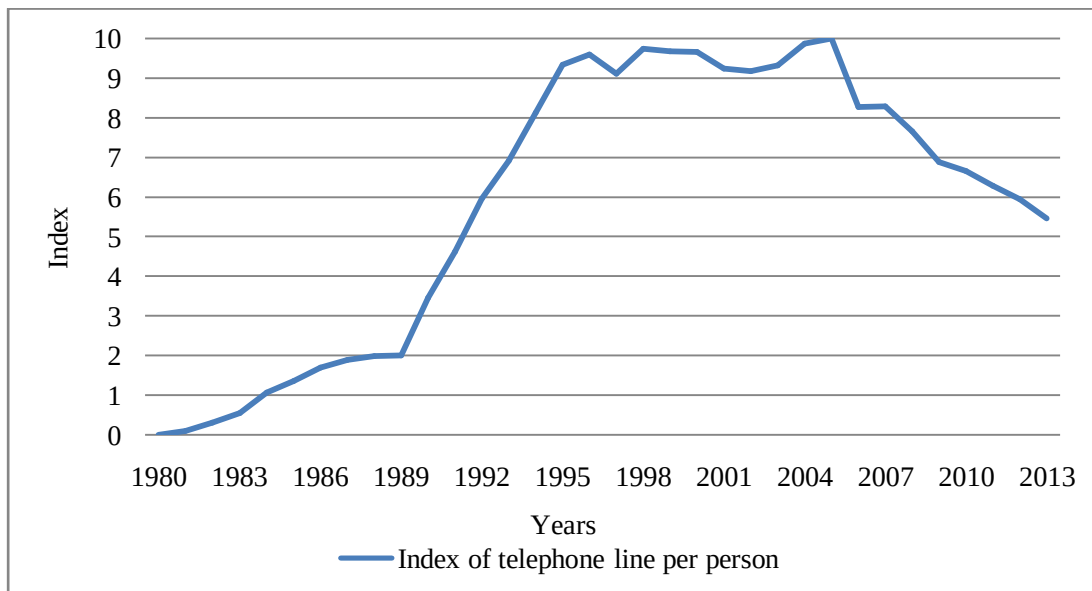


Figure 5.12 : Index of telephone line per person.

Socio-cultural index that consists of the mentioned indices above is shown at Figure 5.13. The index increased gradually between 1980 and 2004. There is a decrease between 2004 and 2006. However, the index started to rise slowly up until 2012. In 2012, it reached its top value.

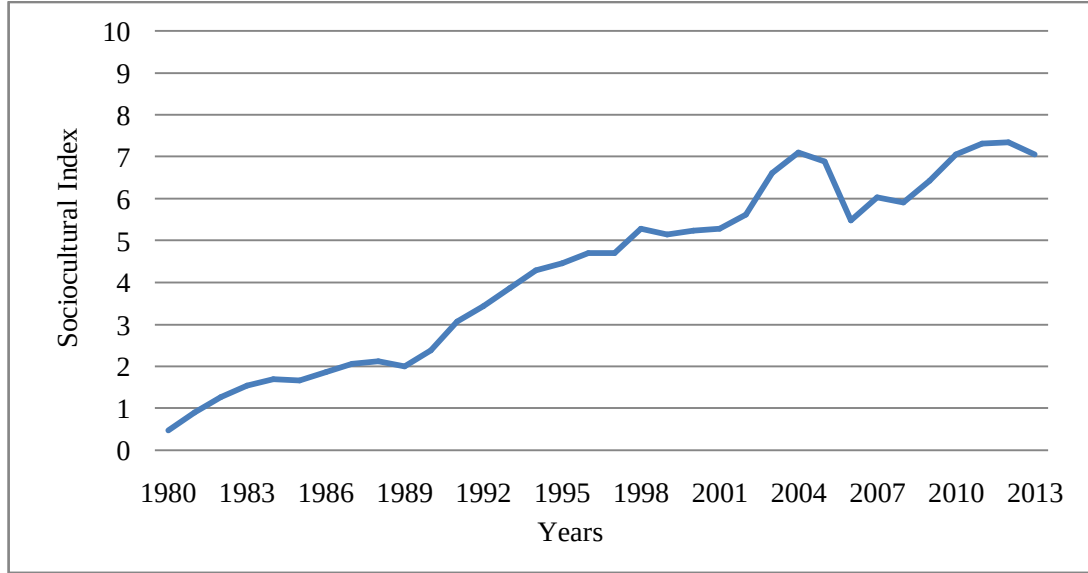


Figure 5.13 : Socio-cultural index.

5.3 Methodology

In time series analysis, it is necessary to determine stationarity structures of the variables. The model, which is estimated with the non-stationary data, leads to spurious regression. The regression analysis estimated by the non-stationary time series can reflect the real relationship if there is co-integration relationship between these series (Gujarati, 2004, pp.820-822).

The first step will be to check the level of stationarity for all variables by an Ng-Perron (2001) test. This test consists of four different unit root tests: MZ_α and MZ_t which are the modified forms of Phillips-Perron (PP) (1988) Z_α and Z_t tests, MSB , and MPT . The test statistics of these tests can be calculated by:

$$MZ_\alpha = Z_\alpha + \left(\frac{T}{2}\right) (\hat{\theta}_1 - 1)^2 \quad (5.8)$$

$$MSB = (T^{-2} \sum_{t=1}^T Y_{t-1}^2 / s^2)^{1/2} \quad (5.9)$$

$$MZ_t = MSB \times MZ_\alpha \quad (5.10)$$

$$MPT = [\bar{c}T^{-2} \sum_{t=1}^T Y_{t-1}^2 - \bar{c}T^{-1}Y_T^2] / s_{AR}^2 \quad (5.11)$$

where $\left(\frac{T}{2}\right)(\hat{\theta}_1 - 1)^2$ is the correction factor, T is number of observations, $\hat{\theta}_1$ is the coefficient of autoregressive variable, s^2 is the consistent estimator of long-term variance (σ_ε^2), s_{AR}^2 ¹⁶ is an autoregressive estimate of the spectral. The null hypothesis of MZ_α , MZ_t is that the series are not stationary and the null hypothesis of MSB, MPT is that the series are stationary. If Ng-Perron (2001) test statistics (absolute value) of MZ_α , MZ_t are less and Ng-Perron (2001) test statistics of MSB, MPT are greater than the critical values, the series are not stationary which means that there is a unit root. If Ng-Perron (2001) test statistics (absolute value) of MZ_α , MZ_t are greater and Ng-Perron (2001) test statistics of MSB, MPT are less than the critical values, the series are stationary which means that there is no unit root.

The second step is to check the co-integration relationship between the variables. The most common way to determine this relationship between the variables is two-step method of Engle and Granger (1987), and cointegration test of Johansen (1988). The condition to use Johansen co-integration test is that all series must be stationary at the same order. The equation of Johansen co-integration test depends on the analysis of vector autoregression (VAR) which includes the level and lagged values of each variable. This equation can be written as:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \dots + \Gamma_{k-1} \Delta X_{t-k} + \Pi \Delta X_{t-k} + \varepsilon_t \quad t = 1, 2, \dots \quad (5.12)$$

$$\Gamma_i = -I + \Pi_1 + \dots + \Pi_i \quad i = 1, \dots, k \quad (5.13)$$

where Π is the matrix of coefficients, $p \times r$ dimensional coefficients' matrix (Π) is equal to the multiplication of α and β matrices. The rank of coefficients' matrix (Π) gives important information about the number of cointegration vector. The existence of cointegration relationship is tested by Trace test or Maximum Eigen value test. The values of λ_{trace} and λ_{max} is compared to the critical values of Johansen and Juselius (1990). If test statistics are higher than the critical values, the null hypothesis which is that there is no cointegration relationship is rejected.

The third step is to estimate equation 5.2 by using Generalized Method of Moments (GMM). Generalized Method of Moments (GMM), which is developed by Hansen (1982), is a simple alternative to other estimator (Johnston and Dinardo, 1997).

¹⁶ $s_{AR}^2 = \frac{\hat{\sigma}_k^2}{(1-\hat{\gamma}(1))^2}$; $\hat{\sigma}_k^2 = (T-k)^{-1} \sum_{t=k+1}^T \hat{\varepsilon}_t^2$; $\hat{\gamma}(1) = \sum_{i=1}^k \hat{\gamma}_i$.
 $\hat{\gamma}_i$ is obtained from $\Delta e_t = \gamma_0 + \gamma e_{t-1} + \sum_{i=1}^k \gamma_i \Delta e_{t-i} + \varepsilon_t$.

There are many special cases of GMM such as Ordinary Least Squares (OLS), instrumental variable estimation, two-stage least squares and the key advantage of this estimation technique is that merely specification of certain moment conditions is required (Hamilton, 1994). w_t is a vector of variables at time t , θ is coefficients' unknown vector, $h(\theta, w_t)$ is vector-valued function, and θ_0 is the true value of θ , so the expectation of $h(\theta_0, w_t)$ is equal to zero. It is defined as orthogonality conditions. $g(\theta, \varphi_T)^{17}$ denotes the sample average of $h(\theta, w_t)$ (Hamilton, 1994):

$$g(\theta; \varphi_T) = \left(\frac{1}{T}\right) \sum_{t=1}^T h(\theta, w_t) \quad (5.14)$$

GMM estimator $\hat{\theta}_T$ is the minimized value of the following equation:

$$Q(\theta; \varphi_T) = [g(\theta; \varphi_T)]' W_T g(\theta; \varphi_T) \quad (5.15)$$

where $g(\theta, \varphi_T)'$ is vector transposition, T is a sample size, W_T is the positive definite and symmetric weighting matrix that converges in probability to W (Hamilton, 1994; Hall, 2009).

W is the best selection in order to be a consistent estimate of $VAR[g(\theta; \varphi_T)]^{-1}$, and the estimator, which is produced by equation 5.15, is consistent (Johnston and Dinardo, 1997).

In calculating optimal weighting matrix, it is assumed that when the true value θ_0 is assessed, $h(\theta_0, w_t)$ is strictly stationary with mean zero and its autocovariance matrix is denoted as:

$$\Gamma_v = E\{[h(\theta_0, w_t)][h(\theta_0, w_{t-v})']\} \quad (5.16)$$

The autocovariances are assumed as absolutely summable and S is the asymptotic variance of the sample mean of $h(\theta_0, w_t)$ is expressed as:

$$S = \sum_{v=-\infty}^{\infty} \Gamma_v \quad (5.17)$$

When the minimum asymptotic variance for $\hat{\theta}_T$, which is the GMM estimator, is selected to minimize:

$$Q(\theta; \varphi_T) = [g(\theta; \varphi_T)]' S^{-1} g(\theta; \varphi_T) \quad (5.18)$$

where S^{-1} is the inverse of the asymptotic variance matrix.

¹⁷ $\varphi_T = (w_T', w_{T-1}', \dots, w_1')'$.

Assuming that there is no serial correlation, $\hat{\theta}$ is the consistent estimator of θ . If vector process of $h(\theta_0, w_t)$ is serially uncorrelated, S is consistently estimated as:

$$S_T = \left(\frac{1}{T}\right) \sum_{t=1}^T [h(\theta_0, w_t)][h(\theta_0, w_t)]' \quad (5.19)$$

The knowledge of θ_0 is required in calculating equation 5.19, so it processes as:

$$\hat{S}_T = \left(\frac{1}{T}\right) \sum_{t=1}^T [h(\hat{\theta}_T, w_t)][h(\hat{\theta}_T, w_t)]' \xrightarrow{p} S \quad (5.20)$$

where GMM estimator ($\hat{\theta}_T$) and iterated GMM estimator ($\hat{S}_T$) are consistent estimators of θ_0 and $S(\theta_0)$, respectively.

If vector process of $h(\theta_0, w_t)$ is serial correlated, Newey-West (1987) suggests that S can be consistently estimated as:

$$\hat{S}_T = \hat{\Gamma}_{0,T} + \sum_{v=1}^q \left\{1 - \left[\frac{v}{q+1}\right]\right\} (\hat{\Gamma}_{v,T} + \hat{\Gamma}_{v,T}') \quad (5.21)$$

where $\hat{\Gamma}_{v,T}$ is equal to $\left(\frac{1}{T}\right) \sum_{t=v+1}^T [h(\hat{\theta}, w_t)][h(\hat{\theta}, w_{t-v})]'$ and $\hat{\theta}$ is the initial consistent estimate of θ_0 (Hamilton, 1994). $\left\{1 - \left[\frac{v}{q+1}\right]\right\}$ is known as kernel, q is named as the bandwidth. The kernel and bandwidth must content accurate restrictions in order to provide $\hat{S}_T$ is consistent and positive semi-definite (Newey and West, 1987, 1994).

Generalized Method of Moments (GMM) set the identifying restrictions and ignore overidentifying restrictions. The validity of model that means the full set of orthogonality conditions are valid can be test by J-statistic.

The hypotheses of J- statistic are expressed as (Hall, 2009):

$$H_0: g(\hat{\theta}_T) = 0 \quad (5.22)$$

$$H_A: g(\hat{\theta}_T) \neq 0 \quad (5.23)$$

The null hypothesis which is the model is valid is tested against the alternative hypothesis that is the model is not valid. J-statistic is defined as (Hansen, 1982):

$$J_T = T g(\hat{\theta}_T)' \hat{S}_T^{-1} g(\hat{\theta}_T) \quad (5.24)$$

where equation 5.24 converges to χ_{d-f}^2 distribution, d is the number of moment condition and f is the number of estimator.

If J_T is higher than χ^2_{d-f} (chi-square) value, the model is not valid. In other words, the null hypothesis is rejected (Hansen, 1982; Hall, 2009, pp. 9-10; Johnston and Dinardo, 1997, p. 337).

5.4 Estimations and Results

In the thesis, the relationship between human capital and economic growth in Turkey between 1980 and 2013 is examined. Firstly, Ng-Perron (2001) test is applied with an intercept and with an intercept and trend for level and first differences of the variables. Maximum lag length is chosen by Schwarz Info Criterion (SIC).

Table 5.3 shows the unit root test results of all variables¹⁸. According Ng-Perron (2001) test results, the natural logarithm of gross domestic product (GDP) per labor (lny), the natural logarithm of capital stock per labor (lnk) and the natural logarithm of human capital index (lnh) are not stationary at their levels. These variables have unit root. However, the first differences of all variables are stationary. In other words, they have no unit root at their first differences. So it is obvious that lny , lnk and lnh are integrated at order one ($I(1)$).

After determining the integrated order of all variables, the next step that is Johansen (1988) cointegration test can be employed to examine the co-integration relationship amongst the variables. The reason to be used Johansen (1988) cointegration test to examine co-integration is that the variables are integrated at their same orders. Before testing cointegration, it is necessary to determine optimum lag length. The optimum lag length is chosen as 2 by Schwarz Info Criterion (SIC)¹⁹.

Johansen (1988) cointegration test result²⁰ is shown at Table 5.4. According to cointegration test result, both the result of Trace statistic and Maximum Eigenvalue statistic are higher than 0.05 critical values. Under this circumstance, the null hypothesis can be rejected. There is a cointegration relationship between the variables.

¹⁸ See Appendix A1.

¹⁹ See Appendix A2.

²⁰ See Appendix A3.

Table 5.3 : Stationary test results.

Ng-Perron Test Statistic				
Variable	Level			
	Intercept			
	MZa	MZt	MSB	MPT
<i>lny</i>	0.72734	0.56906	0.78237	42.8372
<i>lnk</i>	1.36862	2.10615	1.53889	166.876
<i>lnh</i>	0.41855	0.30829	0.73657	36.4642
Variable	Intercept & Trend			
	MZa	MZt	MSB	MPT
	MZa	MZt	MSB	MPT
<i>lny</i>	-13.3946	-2.52077	0.18819	7.17547
<i>lnk</i>	-6.07772	-1.53487	0.25254	14.7866
<i>lnh</i>	-1.66775	-0.68668	0.41174	37.0121
Variable	First Difference			
	Intercept			
	MZa	MZt	MSB	MPT
Δlny	-14.6655***	-2.70092***	0.18417**	1.69695***
Δlnk	-15.7362***	-2.78760***	0.17715**	1.62166***
Δlnh	-12.7893**	-2.44997***	0.19156**	2.21456**
Variable	Intercept & Trend			
	MZa	MZt	MSB	MPT
	MZa	MZt	MSB	MPT
Δlny	-14.3782*	-2.68123*	0.18648	6.33784*
Δlnk	-15.5723*	-2.78995*	0.17916*	5.85416*
Δlnh	-15.5684*	-2.78807*	0.17908*	5.86465*

Notes: Test statistics are compared to the critical values are Ng-Perron (2001)'s Table 1. ***, **, * denotes that the null hypothesis of Mza and MZt is rejected and the null hypothesis of MSB and MPT is accepted the levels of significance at 1%, 5% and 10%, respectively.

Table 5.4 : Cointegration test result.

Johansen Cointegration Test				
Trace Test				
Null Hypothesis	Alternative Hypothesis	Trace Statistic	0.05 Critical Value	Probability
$r=0$	$r=1$	52.82013	42.91525	0.0039**
$r \leq 1$	$r=2$	18.22536	25.87211	0.3290
$r \leq 2$	$r=3$	7.597188	12.51798	0.2863
Maximum Eigenvalue Test				
Null Hypothesis	Alternative Hypothesis	Max-Eigen Statistic	0.05 Critical Value	Probability
$r=0$	$r=1$	34.59476	25.82321	0.0027**
$r \leq 1$	$r=2$	10.62818	19.38704	0.5520
$r \leq 2$	$r=3$	7.597188	12.51798	0.2863

Notes: ** denotes that the rejection of the null hypothesis by the level of significance at 5%.

Equation 5.2 is estimated by Generalized Method of Moments (GMM) (Hansen, 1982). In this model, instrumental variables, which are the determinant of orthogonality conditions, are defined as: the natural logarithm of capital stock per person (lnk), the natural logarithm of lagged value of capital stock per person ($lnk(-1)$), the natural logarithm of human capital index (lnh), the natural logarithm of lagged value of human capital index ($lnh(-1)$) and constant term.

Table 5.5 shows the results of GMM estimation²¹. According probability of J-statistic, it is less than significance level at %5. In other words, the null hypothesis (5.22) of J-statistic cannot be rejected and the estimated model is valid. Moreover, the estimated model's residuals are normally distributed according to Jarque-Bera test result. Further, R^2 is remarkably high which means that any change in GDP per labor is significantly explained by any changes in capital stock per labor and human capital index. The coefficients of lnk and lnh are statistically significant at 1% and 10 %, respectively. The signs of lnk and lnh are positive as it is expected. These coefficients can be interpreted as 1% increase in human capital index leads to 0.07% increase in GDP per labor and 1% increase in capital stock per labor has 0.53% impact on GDP per labor in a positive way. It can be clearly seen that the effect of capital stock per labor on GDP per labor is highly greater than the effect of human capital index.

Table 5.5 : GMM results.

Dependent variable: lny				
Variable	Coefficient	Standard Error	t-statistic	Probability
lnk	0.535523	0.108207	4.949060	0.0000***
lnh	0.075984	0.040377	1.881897	0.0696*
C	3.227996	0.906590	3.560592	0.0013***
R-squared	0.954681	Mean dependent var	8.048934	
Adjusted R-squared	0.951659	S.D. dependent var	0.235936	
S.E. of regression	0.051874	Sum squared resid	0.080728	
Durbin-Watson stat	0.936915	J-statistic	4.414890	
Instrument rank	5	Prob(J-statistic)	0.109981	
Diagnostic test				
Jarque-Bera	0.423195	Probability	0.809290	

Notes: Constant term is denoted as C. *** and * denote the levels of significance at 1% and 10%, respectively. Weighting matrix is chosen as HAC (Bartlett kernel, Newey-West fixed bandwidth=4.000).

²¹ See Appendix A4.

6. CONCLUSION

The relationship between human capital and economic growth is tested particularly after the mid-1980s by using the endogenous growth theory. Until the mid-1980s, it had been commonly accepted that physical capital is one of the most important engine of output level and its growth rate. However, the effect and contribution of physical capital might be limited with the capacity of the people who use them. So, less skilled individuals might be the reason of low growth rate. The world has been changing fastly due to technology. Adapting the new technology and its use accurately can enhance the growth rate of economies. So, skilled individuals are necessary for higher productivity in all production factors, and they produce new information to progress more.

On the basis of this view, the thesis aims to determine the relationship between human capital and economic growth in Turkey in the period 1980-2013. Furthermore, the effect of capital is examined besides the effect of human capital on economic growth in Turkey. This target relationship is found out by using Johansen (1988) cointegration test and Generalized Method of Moments (GMM) (Hansen, 1982).

Following to the theoretical and empirical studies, economic growth is denoted by the gross domestic product (GDP) per labor. Physical capital is presented by capital stock per labor and human capital index are calculated by using education, health and socio-cultural indicators. Education dimension of human capital is characterized by the number of students in primary education (primary and secondary school), high school (general and vocational high school) and higher education (university), high school enrollment rate and higher education enrollment rate. Health dimension of human capital is represented by public spending on health as a share of gross domestic product (GDP), total spending on health as a share of gross domestic product (GDP), life expectancy at birth, the number of health institution per person, the number of bed in hospitals per person, the number of healthcare personnel per person. Socio-cultural dimension of human capital is represented by the number of newspaper per person, the number of library per person, the number of book per

person, telephone line per person. The human capital indicators are standardized by using Dreher's (2006) paper. After determining long-run relationship among GDP per labor, capital stock per labor and human capital index by cointegration, Generalized Method of Moments (GMM) (Hansen, 1982) is used to estimate the coefficients of capital stock per labor and human capital index.

The long-run relationship between human capital and economic growth is revealed according to Johansen (1988) cointegration test result. The estimated model by GMM reveals that both capital stock per labor and human capital index significantly and positively affect gross domestic product (GDP) per labor. As the coefficient of capital stock per labor is estimated at 0.53, human capital index's coefficient is estimated at 0.07. While 1% increase in capital stock per labor leads to 0.53 increase in GDP per labor, 1% increase in human capital index leads to 0.07% increase in GDP per labor. It is obvious that the effect of capital stock per labor on GDP per labor is highly greater than the effect of human capital on GDP per labor.

From these results, it can be said that the effect of human capital on economic growth is not as much as the effect of physical capital on economic growth. The result, which physical capital is the main source of economic growth in Turkey, is highly consistent with empirical results of Altug et al. (2008), Ismihan and Metin-Ozcan (2009). Additionally, many studies in Turkey reveal that there is a positive relationship between human capital and economic growth.

These results emphasize the importance of Turkey's policy implementation for human capital. Policymakers in Turkey should reform their policies, especially education and health policies. Even though the levels of education and health spendings in Turkey show an upward trend in general, many indicators related to education and health are still highly lower than developed countries or OECD average. The policymakers in Turkey play a crucial role under these circumstances. Education policies should be regulated by observing the sectors' needs and paying attention the structure of societies. The policymakers and firms should allocate their resources rationally.

First and foremost, policies should be reformed by focusing on education quality in Turkey. The main problem of Turkish education system is the lack of quality. Mainly, education system depends on learning-by-heart since primary education. So,

education type should be adjusted to direct students to questioning all types of information. Practical studies should be added to syllabus since high school. In implementing education policies, it should be aware of sectors' needs. Since the number of departments on higher education is not enough to obtain high quality. There are a great many universities in Turkey. However, many departments in these universities do not meet the sectors' requirement in terms of quality and need. Eventually, many graduates cannot find a job or they start to lose their abilities as working for any kind of job that they do not want to work. It leads to increase in the unemployment rate.

Additionally, firms should be encouraged to provide their workers on-the-job training. Many workers, who are over middle-age, cannot adapt technological change as easily as the young. In this case, firms should allocate a part of their budget to educate these workers, since these workers have spent a big part of their lives for their work. Hence, their experiences have accumulated so much. They have a chance to improve their knowledge and skills thanks to these on-the-job-training. Furthermore, firms should work with universities simultaneously. Especially, university students can maintain their studies with firms and they improve their knowledge by taking place inside the sector directly.

Next in order, education policy should be adjusted in regards to attainability. In other words, education inequalities should be removed and individuals should access every type of information. Most of the high quality universities are in the western part of Turkey. High quality education opportunities should be spread toward each parts of Turkey. However, many of these policies come true as long as an investment in education increases. Both public and private spending on education should be increased.

Last but not least, in the literature, health dimension of human capital becomes crucial for economic growth. Although, the amount of spending on health in Turkey has been increasing, many health indicators are still lower than developed countries or OECD average. Additionally, while the amount of spending on health in Turkey increases, the proportion of total expenditure on health to gross domestic product (GDP) decreases. Even if an investment in education is augmented, societies, in which individuals have a limited health opportunity, cannot proceed fast during economic growth process. Population in Turkey is increasing, and the number of

health institutions, healthcare personnel, and beds should be parallel with population growth rate. Each of the healthy citizens in Turkey will lead to ameliorate not only other health indicators such as increasing in life expectancy at birth, decreasing mortality rate and baby mortality rate, decreasing fertility rate, and but also increasing productivity in marketplace in general. Hence, health policy in Turkey should be adjusted in such a way that every citizen can access to health facilities.

Apart from education and health, socio-cultural dimension of human capital is really important for making citizens intelligent and happy, and providing them a viable environment. The enrichments of libraries, books, newspapers and periodicals, archives, art galleries, cinemas and so on, which are necessary to people's self-development, are crucial to expand people's knowledge levels. People can both aware of their past and adapt what is happening all around the world by cultural activities. In addition to culture, infrastructure opportunities such as transportation, telephone, and internet boost life quality of people. Municipalities in Turkey invest in infrastructure and cultural activities in order to accelerate adaptation for technology and to make their citizens more sociable. Sociable, stress-free, happy citizens will contribute to labor market efficiently.

To sum up, the spillover effects of education, health, socio-cultural dimensions of human capital cannot be deniable. The returns of education and health investment are higher than physical capital's return (Karatas and Cankaya, 2010, p. 50). Educated individuals can contribute to economic growth, productivity and their earnings for a long time as long as they are healthy and happy. Additionally, physical capital and technology can be used by educated and healthy individuals more efficiently and accurately. It should not be forgotten that the required knowledge for technology is produced by skilled labor. Thus, all type of investment that stimulates spillover effect of human capital should be promoted by the policymakers in Turkey.

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APPENDICES

APPENDIX A: E-Views 9.0 Outputs

APPENDIX A1: E-views 9.0 Ng-Perron test outputs

APPENDIX A2: E-views 9.0 Lag length selection output

APPENDIX A3: E-views 9.0 Johansen cointegration test output

APPENDIX A4: E-views 9.0 Generalized Method of Moments (GMM) output

APPENDIX A: E-Views 9.0 Outputs

APPENDIX A1: E-views 9.0 Ng-Perron test outputs

Null Hypothesis: D(LNY) has a unit root				
Exogenous: Constant				
Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=8)				
Sample (adjusted): 1981 2013				
Included observations: 33 after adjustments				
	MZa	MZt	MSB	MPT
Ng-Perron test statistics	-14.6655	-2.70092	0.18417	1.69695
Asymptotic critical values*: 1%	-13.8000	-2.58000	0.17400	1.78000
5%	-8.10000	-1.98000	0.23300	3.17000
10%	-5.70000	-1.62000	0.27500	4.45000
*Ng-Perron (2001, Table 1)				
HAC corrected variance (Spectral GLS-detrended AR)				0.002823
Null Hypothesis: D(LNY) has a unit root				
Exogenous: Constant, Linear Trend				
Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=8)				
Sample (adjusted): 1981 2013				
Included observations: 33 after adjustments				
	MZa	MZt	MSB	MPT
Ng-Perron test statistics	-14.3782	-2.68123	0.18648	6.33784
Asymptotic critical values*: 1%	-23.8000	-3.42000	0.14300	4.03000
5%	-17.3000	-2.91000	0.16800	5.48000
10%	-14.2000	-2.62000	0.18500	6.67000
*Ng-Perron (2001, Table 1)				
HAC corrected variance (Spectral GLS-detrended AR)				0.002685

Figure A1. 1 : The first difference output of GDP per labor.

Null Hypothesis: D(LNK) has a unit root

Exogenous: Constant

Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=8)

Sample (adjusted): 1981 2013

Included observations: 33 after adjustments

	MZa	MZt	MSB	MPT
Ng-Perron test statistics	-15.7362	-2.78760	0.17715	1.62166
Asymptotic critical values*: 1%	-13.8000	-2.58000	0.17400	1.78000
5%	-8.10000	-1.98000	0.23300	3.17000
10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.000646
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Null Hypothesis: D(LNK) has a unit root

Exogenous: Constant, Linear Trend

Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=8)

Sample (adjusted): 1981 2013

Included observations: 33 after adjustments

	MZa	MZt	MSB	MPT
Ng-Perron test statistics	-15.5723	-2.78995	0.17916	5.85416
Asymptotic critical values*: 1%	-23.8000	-3.42000	0.14300	4.03000
5%	-17.3000	-2.91000	0.16800	5.48000
10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.000601
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Figure A1. 2 : The first difference output of capital stock per labor.

Null Hypothesis: D(LNH) has a unit root
 Exogenous: Constant
 Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=8)
 Sample (adjusted): 1981 2013
 Included observations: 33 after adjustments

	MZa	MZt	MSB	MPT
Ng-Perron test statistics	-12.7893	-2.44997	0.19156	2.21456
Asymptotic critical values*: 1%	-13.8000	-2.58000	0.17400	1.78000
5%	-8.10000	-1.98000	0.23300	3.17000
10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.005010
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Null Hypothesis: D(LNH) has a unit root
 Exogenous: Constant, Linear Trend
 Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=8)
 Sample (adjusted): 1981 2013
 Included observations: 33 after adjustments

	MZa	MZt	MSB	MPT
Ng-Perron test statistics	-15.5684	-2.78807	0.17908	5.86465
Asymptotic critical values*: 1%	-23.8000	-3.42000	0.14300	4.03000
5%	-17.3000	-2.91000	0.16800	5.48000
10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.003074
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Figure A1. 3 : The first difference output of human capital index.

APPENDIX A2: E-views 9.0 Lag length selection output

VAR Lag Order Selection Criteria
 Endogenous variables: LNY LNK LNH
 Exogenous variables: C
 Date: 01/15/16 Time: 13:20
 Sample: 1980 2013
 Included observations: 29

Lag	LogL	LR	FPE	AIC	SC	HQ
0	66.66603	NA	2.49e-06	-4.390760	-4.249316	-4.346462
1	170.1838	178.4789*	3.69e-09*	-10.90922	-10.34345*	-10.73203*
2	178.6935	12.91126	3.91e-09	-10.87541	-9.885300	-10.56532
3	188.8976	13.37100	3.82e-09	-10.95846	-9.544014	-10.51547
4	196.5762	8.472846	4.70e-09	-10.86732	-9.028544	-10.29144
5	209.3700	11.47034	4.46e-09	-11.12897*	-8.865855	-10.42019

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Figure A2. 1 : The output of lag length selection.

APPENDIX A3: E-views 9.0 Johansen cointegration test output

Date: 01/15/16 Time: 13:22
 Sample (adjusted): 1983 2013
 Included observations: 31 after adjustments
 Trend assumption: Linear deterministic trend (restricted)
 Series: LNY LNK LNH
 Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.672399	52.82013	42.91525	0.0039
At most 1	0.290251	18.22536	25.87211	0.3290
At most 2	0.217351	7.597188	12.51798	0.2863

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.672399	34.59476	25.82321	0.0027
At most 1	0.290251	10.62818	19.38704	0.5520
At most 2	0.217351	7.597188	12.51798	0.2863

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Figure A3. 1 : Johansen cointegration test output.

APPENDIX A4: E-views 9.0 Generalized Method of Moments (GMM) output

Dependent Variable: LNY
Method: Generalized Method of Moments
Date: 01/15/16 Time: 13:36
Sample (adjusted): 1981 2013
Included observations: 33 after adjustments
Linear estimation with 1 weight update
Estimation weighting matrix: HAC (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)
Standard errors & covariance computed using estimation weighting matrix
Instrument specification: LNK LNK(-1) LNH LNH(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNK	0.535523	0.108207	4.949060	0.0000
LNH	0.075984	0.040377	1.881897	0.0696
C	3.227996	0.906590	3.560592	0.0013
R-squared	0.954681	Mean dependent var	8.048934	
Adjusted R-squared	0.951659	S.D. dependent var	0.235936	
S.E. of regression	0.051874	Sum squared resid	0.080728	
Durbin-Watson stat	0.936915	J-statistic	4.414890	
Instrument rank	5	Prob(J-statistic)	0.109981	

Figure A4. 1 : The output of Generalized Method of Moments (GMM).

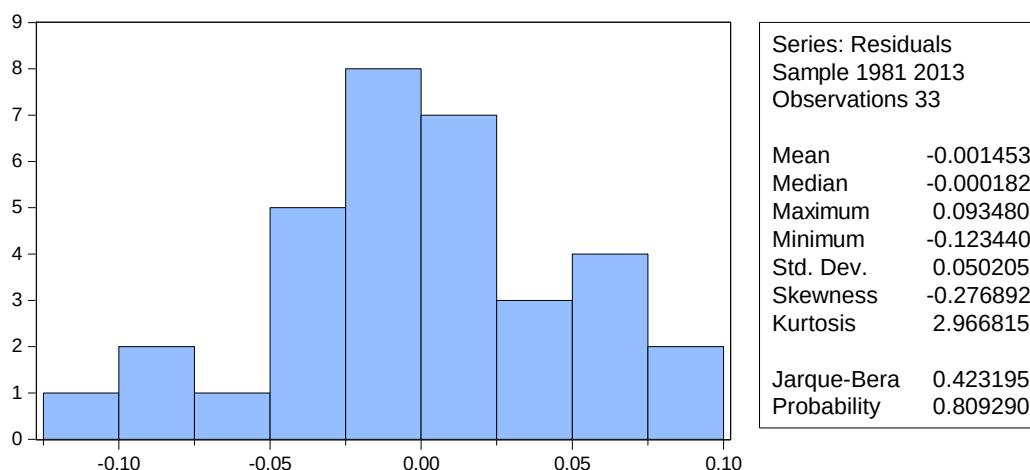


Figure A4. 2 : The output of Jarque-Berra test.

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List of Publications and Patents:

- Karakas, A. (2014). The Impacts of Trade Liberalization on Gender. *Nişantaşı Üniversitesi Sosyal Bilimler Dergisi*, 2(2), 41-47.
- Genc, H., and Karakas, A. (2015). Turizm Sektörünün Türkiye İstihdamına Etkisi Üzerine Bir Değerlendirme. In Prof. Dr. M. Sarıışık, Assoc. Prof. Dr. A. Saldamlı (Eds.), *2nd International Congress of Tourism and Management Researches Proceeding Book* (pp. 432-446). Kuşadası, Turkey: Arda Yayıncılık, May 01-03.